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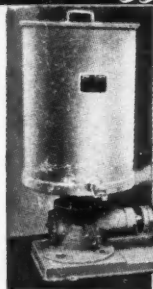
VOL LXII

6 MAY 1950

No 1608

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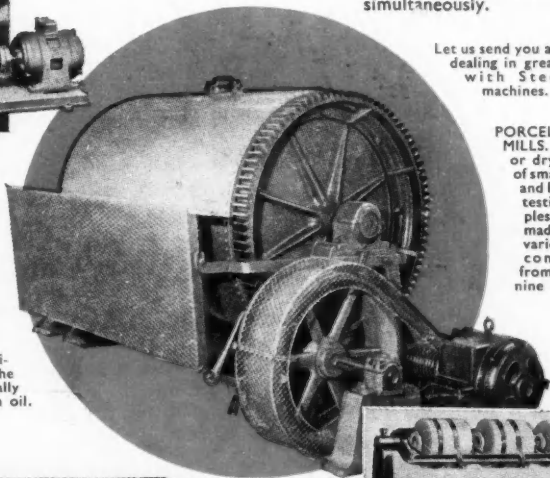
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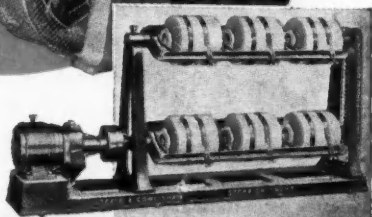
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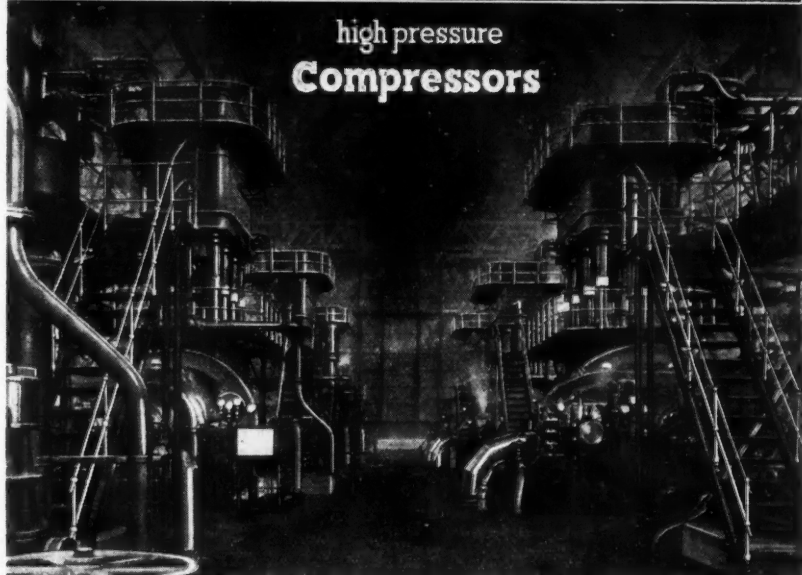
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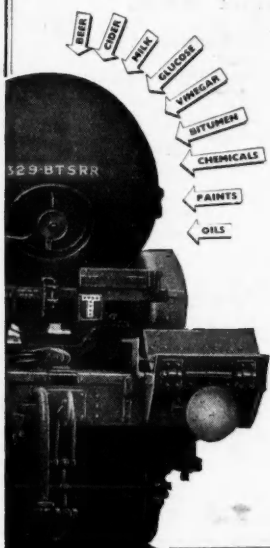
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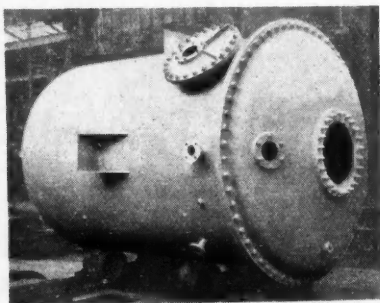
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MODEL 'C'

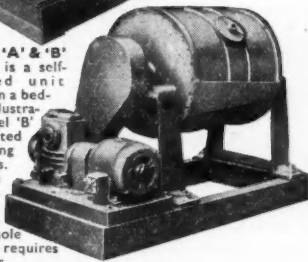
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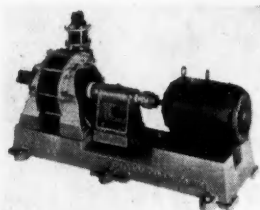
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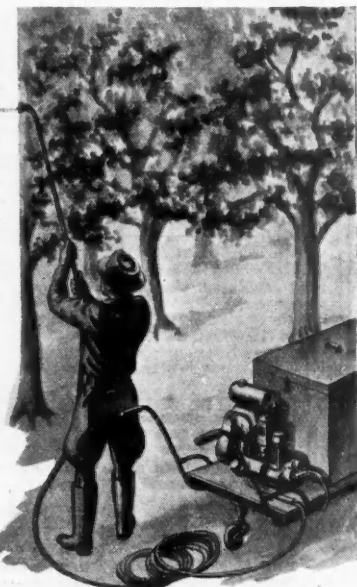
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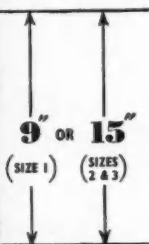
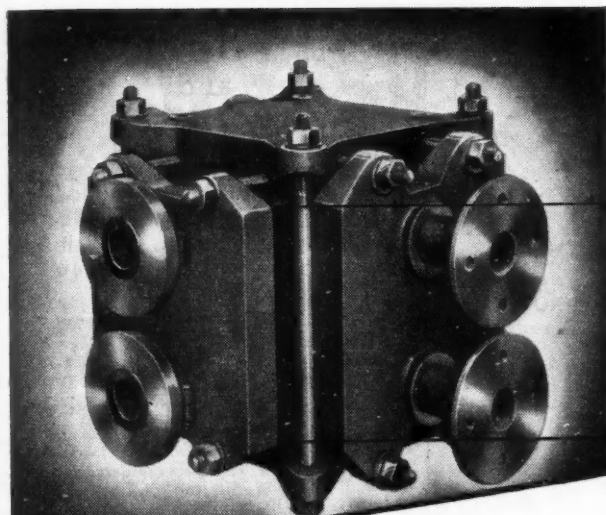
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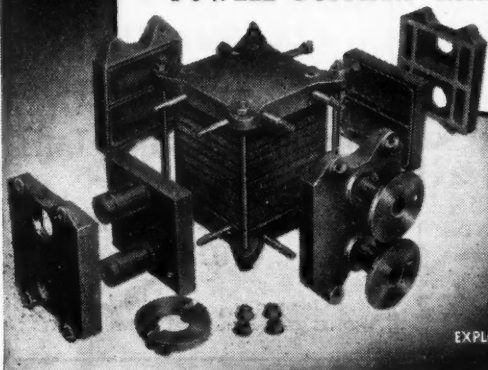
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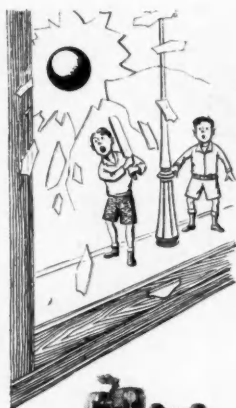
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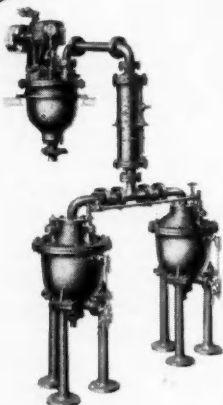
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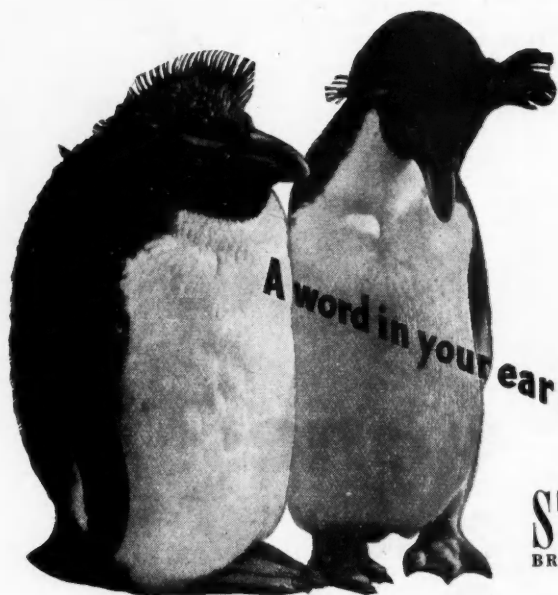
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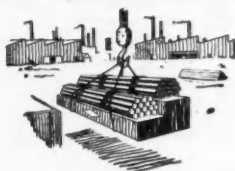
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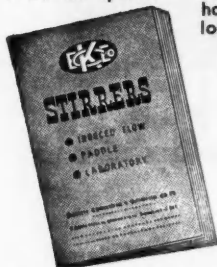
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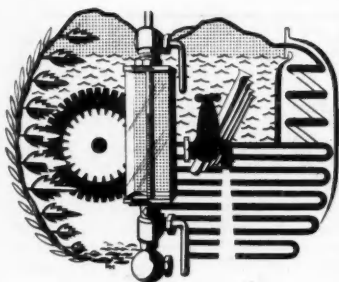
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1. G. Schwarzenbach and H. Ackermann. Komplexe V. Die Äthylendiamine-tetraessigsäure. *Helvetica Chimica Acta*, 30, 1798 (1947).
2. W. Biedermann and G. Schwarzenbach. Die Komplexometrische Titration der Erdalkalien und einiger anderer Metalle mit Erichromschwarz T. *Chimia (Switz)*, 2, 56 (1948).
3. G. Schwarzenbach, W. Biedermann and F. Bangerter. Komplexe VI. Neue einfache Titrationsmethoden zur Bestimmung der Wasserhärte. *Helvetica Chimica Acta*, 29, 811 (1946).
4. J. D. Betz and C. A. Noll. *Journal of the American Water Works Association*, 41, 982 (1949).

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Volume LXII

6 May 1950

Number 1608

Neglected Fertiliser Research

THE world's fertiliser industry was founded by Sir John Bennet Lawes when he began to manufacture superphosphate in 1840/41, first in his own farm sheds and then in a factory at Deptford, London. To what extent the idea of acid treatment came from Liebig, who had suggested it in his statement of the mineral theory of plant nutrition, is controversy which had better be left to chemistry's historians. As a technological development, all the credit for superphosphate must certainly be given to Lawes and this country.

After 30 successful years as a fertiliser manufacturer, Lawes sold his business and retired to his own Hertfordshire estate to devote himself to research. His farm there was already the centre of continuous field tests. Eventually he "ploughed back" a large proportion of his profits as a manufacturer into the founding of the Lawes Agricultural Trust, and the farm he had inherited as a young man became the Rothamsted Experiment Station, the prototype of all agricultural research stations in this country, the United States, and, indeed, the world. Today this same trust manages Rothamsted.

This may now seem dusty history.

The contemporary importance lies in the fact that Rothamsted depended for at least its first half century upon the vision of a manufacturer and his willingness to devote his own commercial fortune and inherited property to research. It is ironic that Rothamsted fertiliser research, then and now, has been entirely devoted to their use; so, too, has been the research at all other British centres since established. There has never been a national research station to study the problems of fertiliser manufacture, and it is only in the past two years that the British industry has begun to discuss the formation of a co-operative research association with these special aims. (THE CHEMICAL AGE, 60, 497; 62, 217).

The anomaly which the absence of such a British centre represents was emphasised by Dr. K. D. Jacob's paper on the fertiliser technology research of the U.S. Department of Agriculture, read in London on April 21 by two members of his staff now visiting this country, Mr. John O. Hardesty and Dr. Kenneth G. Clark. As long ago as 1911 the U.S. Congress provided funds for fertiliser technology research on a continuing basis. In 1921 a research laboratory devoted to fixed nitrogen and originated by the War Department

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was placed under charge of the USDA.

The Division of Fertilisers and Agricultural Lime, now a section of the Bureau of Plant Industry, Soils, and Agriculture Engineering, is responsible "through research and investigation, to point the way to the development of more efficient fertilisers and liming materials and to the lowering of the cost of plant nutrients to the farmer." Some of its most notable achievements, enumerated in Dr. Jacob's paper, have been the development of efficient catalysts for the synthetic ammonia industry; the study of transforming synthetic ammonia into other materials, such as urea; the development of ammonium nitrate for fertiliser use; the pioneering of furnace processes for producing phosphoric acid and of defluorinated phosphate rock; the ammoniation of superphosphate; and (1911-1921) the search for native potash deposits and their development.

With mixed or compound fertilisers, which today comprise 70 per cent of the tonnage used on U.S. farms, the Division has particularly studied the technical aspects of high analysis and physical properties. All this research is conducted in close co-operation with

manufacturers and its results are readily available to the industry.

In the past two or three decades there have been many more technological innovations in the American than in the British industry. American farmers are using large tonnages of fertiliser materials not yet developed here. Granulation, particularly of compound fertilisers, has been pioneered in Britain, but this could be described as an enforced innovation, necessary because the poor condition of powder-type compounds slowed the development of combine drills.

Dr. Jacob's paper could not have been read here at a more opportune time. If there were still doubts as to the advantages of a research centre for fertiliser manufacturing problems, this paper may have disposed of them. The current project of the industry to form a research association certainly appears to have been strengthened by the survey of the United States agriculture department's activities in the past 30 or 40 years.

The Fertiliser Society, itself a fairly new British development, is to be congratulated for arranging so stimulating a meeting.

Notes and Comments

Reduced Profits

SOME of the difficulties with which large-scale chemical producers were faced last year have been reflected in the trading results of the large groups, of which the most revealing are Imperial Chemical Industries', showing that group profits before taxation were £17,323,509—against £22,955,579 the year before. The I.C.I. result cannot be entirely dissociated from the lower level in 1949 of chemical export trading, to which the group is so large a contributor, and there would seem to be good reasons to expect that the I.C.I. fortunes will have since shared the more buoyant trend in the recent export figures by all chemical groups. That, however, is outside the scope of the current report. The preliminary financial summary throws light on some current charges upon industrial chemical production, such as the obligation to provide for tax purposes nearly £6.5 million and almost as much (£6 million) for plant obsolescence and depreciation. The vast influence of the tax demand upon the final state of group profits, which were £10.8 million last year and £11.89 million the year before, is apparent in the fact that the 1949 tax charge was some £4.56 million smaller than in 1948.

Growing Competition

IT is reassuring to note, in relation to the minor setback experienced by Britain's largest chemical group, that much more stubborn trading problems appear to have confronted comparable chemical enterprises in Switzerland. In Basle, Ciba, Ltd., managed to maintain earnings pretty well (S. Fr.14.04 million compared with S. Fr.14.12 million in 1948) but does not disguise the fact that this was aided, probably temporarily, by the continued difficulties in re-establishing the competitive industries in Germany and some other countries. Devaluation, in which Switzerland did not participate, is admitted to have dealt a fairly

heavy blow to the group's sales prospects in the export markets, to which Ciba's response will be to intensify the activity of its overseas subsidiaries. The large productive unit at Horsham, Sussex, and that at Summit, U.S.A., are likely to be very active participants in the policy of expanding pharmaceutical production in the countries providing the markets. The justification of that policy is contained in the fact that the various overseas branches in 1949 were responsible for more than four-fifths of all sales. Sandoz, Ltd., confirms Ciba's observations concerning the heightened difficulty of dyestuffs trading in the export markets. Devaluation and uncertainty of textile industries have produced some sharp declines in the Sandoz figures.

Exhibition Problems

WITH the opening next week of another British Industries Fair comes the temptation to question why chemical and allied manufacturers are again represented by a decreased number of exhibitors. Last year there were 69—12 fewer than in 1948—and this year the number may be as low as 54; they will, however, occupy 26,600 sq. ft. of floor space, compared with 25,000 sq. ft. in 1949. It may be that the large manufacturer, with its greater financial resources, is better able to bear the high cost of erecting and maintaining a stand and derives more material benefits from the prestige of such an exhibition. In support of this theory is the continuing tendency of certain smaller firms to share stands. The persistent difficulty of arranging a display of chemical materials in a way that will catch the eye remains as real as ever. (Of some 6000 chemicals listed in the ABCM's directory, about 95 per cent are whitish powders or colourless liquids.) To circumvent that kind of obstacle the chemical manufacturers at a large trade exhibition may show diagrams, working models, photographs or, where possible, finished products and con-

sumer goods. In recent years they have shown commendable enterprise in this way. The SIMA states that there will be about the same number of firms exhibiting scientific instruments at this year's Fair. This, in view of the fact that the association is sponsoring a large display at the Canadian International Trade Fair in Toronto later this month and is already implementing its advanced plans for the Festival of Britain, may be taken as evidence of the healthy state of that industry, which is the greatest ally of modern analytical chemistry.

Another Strategic Material

ONE of the newer plastics raw materials, polytetrafluoroethylene (PTFE), is in danger of being relegated to the restricted department of "strategic necessities". At present, even at the extremely high prices ruling, the demand—a substantial proportion of which comes from abroad—is reported to be much greater than can be satisfied by the limited quantities being produced here. "Supplies have, of necessity, to be regulated," say the Government officials concerned. There have, however, been exports of a few minor quantities and it is intended that one or two outstanding overseas orders shall be filled if supplies permit. Meanwhile, the Ministry of Supply is said to be able to absorb all the PTFE being made here. The prospect of large-scale exports, the request for which has been attested by inquiries received by this journal, is not at the moment to be entertained. I.C.I., Ltd., the PTFE producers here, is about to overhaul its productive plant, with the aim of doubling its present output. Even then, say the experts, it is likely to be a further two or three years before production in this country can catch up with orders now being offered. If the demand continues on its present scale—as it appears likely to—it is seriously suggested that the time may not be remote when the Board of Trade, which handles this material for export, will have to consider importing PTFE from the U.S.A., the only other country where it is made. The principal outlets for the

PTFE produced in this country are at present packings and electrical components, but a demand which is waiting to be filled, when supplies of the raw material become more adequate and when quantity production reduces prices, is for coverings of high heat resistance, for tables and the like, for which PTFE is said to be eminently suitable.

Forgotten Steel Men

THE alacrity with which decisive achievements in the early history of the modern iron and steel industry are forgotten is pointedly illustrated by the fact that few to-day can call to mind the debts which the industry owes to the Mushet family. Intent on seeing that recognition is given to a family whose collective contributions profoundly influenced the course of iron and steel making in the 18th and 19th centuries is Mr. F. M. Osborn, chairman of a Sheffield steel firm. He has a rich subject in David Mushet, his son Robert Forester and his brother, also Robert. David Mushet, who discovered the economic importance of the Blackland ironstone in Scotland and became one of the foremost authorities in iron and steel production, produced all the advances to his credit by his own unaided experiments "after hours" and ultimately in the face of a good deal of opposition by his employers, the Clyde Iron Works, whose accountant he was in 1792. Eight years later his enterprise, and apparently the jealousy felt by his employers, robbed him of his job as an accountant—a fortunate circumstance for the ferrous metal industries. His son inherited his gifts and made good use of them, most memorably in his improvement of the Bessemer steel process by the addition of molten spiegeleisen (an iron and manganese alloy), which gained him the Bessemer Medal of the Iron and Steel Institute in 1876. About the forebear of this distinguished "steel family", William Mushet of Dalkeith, not even the date of his birth is known. The biographer would welcome any information about the early antecedents of the Mushet family.

NEW ATOMIC TOOL

Linear Accelerator at Harwell

ATOMIC particles can, it is stated, be made to travel at almost the speed of light—186,000 miles per second—in a new research instrument which has just started operating at the atomic establishment at Harwell, Berks. The new machine—a travelling wave linear accelerator—will make possible a big extension of important research work in the design of atomic piles, including those for the production of power. It generates energies of $3\frac{1}{2}$ million electron volts, and radiation of such an intensity that it has had to be installed in its own shelter, in which the walls and roof are made of brick and concrete 4 ft. 6 in. thick.

This is the second high-powered particle accelerator to start working at Harwell. The first was the synchro-cyclotron which began operating in December. The difference between the two is that the first speeds up particles in a circular path, and the new machine in a straight line.

Measuring Nuclear Properties

Some of the most important work in the development of atomic energy is the measurement of nuclear properties of materials and particularly the interactions of neutrons with the atoms of various elements.

The new machine provides a prolific and convenient source of neutrons for such studies. The neutrons are not produced directly; instead, the machine gives out a series of intense short bursts of high energy electrons aimed at a heavy metal target. The impact with the metal produces a corresponding series of bursts of gamma rays. Most of these gamma rays are in turn absorbed in a tank of heavy water; the heavy hydrogen nuclei in the water then break up and emit the neutrons.

A powerful radio transmitter working on a wavelength of 10 cm. provides the electric waves which first speed up the electrons. As many as 1000 million neutrons may be liberated every second by the machine. This intensity is 1000 times greater still in the short pulses, each of which is only 2-millionths of a sec. long.

The basic design was carried out by a group of the Harwell staff, while the development and construction has been done at the Mullard Electronic Research Laboratories of Philips Electrical, Ltd. A similar machine has been operating for some time at the laboratories of the AERE group at Malvern.

PTFE SUPPLIES

Priority Claim of Official Departments

A STATEMENT dealing with the continued relative scarcity of polytetrafluoroethylene plastic material (page 670 this issue) was issued this week by the plastics division of I.C.I., Ltd.

This says that the reason for the present shortage of this polymer (Fluon) is that the output of the existing plant is largely taken up with Service and other Government requirements. However, firms requiring Fluon in connection with Government contracts or sub-contracts may be able to obtain it by stating the particulars to their local I.C.I. sales office, which will seek permission from the Ministry of Supply to deliver the material.

A small quantity has been set aside for purely commercial development during 1950 and part of this has been issued to fabricators who are already experienced in handling the polymer. The remainder will be held for issue to other firms which develop processes requiring its use.

The plastics division observes that it would help to economise supplies if firms would, whenever possible, order cored mouldings instead of ordering solid sections and boring these out themselves. Cored mouldings are often more easily manufactured, in addition to saving polymer, and will help the user by reducing the work which he has to carry out.

Belgian Chemical Dismissals

DIFFICULTIES which have for some time affected the Belgian chemical and allied industries are reported to have been intensified during the last 18 months. The industry employs normally some 50,000 to 60,000 persons but it had to dismiss about 20 per cent. Further dismissals are considered likely. Manufacturers ascribe their difficulties largely to the high cost of coal, which makes it impossible to quote prices which could stand the increased competition by leading foreign chemical manufacturers. The revival of the German chemical industry has also played a considerable part. It is claimed that the liberalisation of trade in Western Europe has in many cases been made illusory by the imposition of new tariffs. Chemical exports, which normally amount to about 10 per cent of the country's total export trade, are still hampered by lack of quota allocations.

MICROCHEMICAL CONGRESS

Many Countries Represented

At least 19 countries will be represented at the First International Microchemical Congress, to be held in Graz, Austria, from July 2-6. Other applications are still awaited.

Papers, which will ultimately be published in full in *Mikrochemie vgt. mit Mikrochimica Acta*, include the following:

"The Use of Organic Complexes for the Separation and Estimation of Metals by Extraction Methods," by E. Abrahamczik, Germany; "Micromethods in the Testing of Materials," by F. Feigl, Brazil; "The Intellectual Basis for the Development of Micromethods," by A. A. Benedetti-Pichler, U.S.A.; "Some Work in the Sphere of Organic Quantitative Microanalysis," by W. Kinstan, Sweden; "The Role of Microchemistry in Relation to New Domains of Analytical Chemistry," by P. W. Wenger, Switzerland; "Microscopic Methods in Microchemistry," by L. Kofler, Austria; "Twenty-five Years of Quantitative Microchemistry in the U.S.A.," by J. Niederl, U.S.A.; "Rapid Micro Combustion Methods for the Determination of Elements in Organic Compounds," by G. Ingram, Great Britain; "Microchemical Methods Applied to Industrial Materials," by C. E. Spooner, Great Britain; "The Separation of Metal-Organic Complexes," by C. L. Wilson and A. K. Almahdi, Great Britain; "Interesting Examples of General Microchemistry," by R. Streibinger, Austria; "Fibre Chromatography," by G. Skalos, Greece; "Trace Detection of the Rarer Elements Using Luminescence Analysis," by H. Haberlandt, Austria; "Applications of Microchemistry to Exploratory Industrial Research," by N. Cherons, U.S.A.; "Automatic C-H-Determination as the Basis of O-Determination, and a New Micro N-Determination," by J. Unterzaucher, Germany; "Microestimation of Halogens, Sulphur and Selenium Spectrochemically," by A. Gatterer, Vatican; "The Determination of Carbon and Hydrogen in Fluorine-containing Compounds," by R. Belcher and H. Goulden, Great Britain; "Estimation of Small Amounts of Sulphur or Sulphur-bearing Plant Substances," by H. Roth, Germany; "Living Cells as Micro Reagents," by E. Flaschentrager, Egypt; "The Standardisation of Microchemical Apparatus in the U.S.A.," by H. K. Alber, U.S.A.; "Outlines of General Microchemistry," by G. Gorbach, Austria; "Instructional and Experimental Development of the Reactions of the International Committee on New Analytical Reactions," by B. J. V. Cuvellier, France; "Narcosis of Protoplasm," by W. Seifriz, U.S.A.

Stearic Acid Imports

DURING the period from May 22 to September 30 individual import licences will be granted for limited quantities of double and triple pressed stearic acid consigned from, and originated in, any country other than: Albania, Argentina, Belgium, Belgian Congo, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian Zone), Germany (Western), Guatemala, Haiti, Honduras, Hungary, Iran, Japan, Liberia, Luxembourg, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Switzerland, Tangier, Uruguay, United States of America, U.S.S.R. Venezuela, Yugoslavia.

CHEMICALS IN EGYPT

Development of Local Resources

THE growth of the chemical industry in Egypt owes its promise of success, among other factors, to an abundance of raw materials and unlimited labour.

According to official sources, 25 factories, employing 5000 men, are producing vegetable oils from cotton seed, linseed, sesame and groundnuts. Annual output is estimated at from 65,000-75,000 tons of oil, of which 7000 tons are used in industries, including 2000 tons for soap, the balance being used as food.

The latest available statistics put the number of soap factories at 213, representing an invested capital of £E3 million and employing 4000 nationals. Ten of the factories are rated "modern."

Production is expected to be increased as soon as oil and imported caustic soda are more freely available.

Caustic Soda

Under a recent barter agreement Italy sent Egypt an agreed quantity of caustic soda in exchange for 20,000 tons of phosphates.

Egypt's annual consumption of caustic soda is estimated at 14,000 tons, of which only 6500 tons are produced locally, nitrate being extracted from the lakes in the regions of Wadi Natroun and Hoch-Issa.

Sulphuric acid is being produced commercially by a factory employing 346 men at Kafr-El-Zayat, but the imported product is, however, said to have some advantages.

Glycerine, industrial and medicinal, is produced by three factories, with an intake of 40 tons a month. This quantity permits an exportable surplus.

Some fertilisers are still being imported and recent tenders accepted by the Government include 26,000 tons of lime superphosphates from Italy and 10,000 tons of ammonium sulphate from Hungary.

The prospects of developing a prosperous cellulose industry utilising reeds are reported by Italian experts to be excellent.

The paper manufacturing industry is well established and concentrates mainly on cardboard and wrapping papers. Pre-war production reached 17,000 tons. It is hoped that Egypt will before long be able to meet its annual newsprint requirements which are assessed at less than 7000 tons.

Perfumes and cosmetics have always been a relatively good market and Egypt has now entered this field as a producer. Some £E100,000 has been invested in 10 factories now employing about 600.

U.K. SCIENTISTS IN U.S.A.

Study of American Technology

A SMALL but important Marshall plan investment has been made in two young British scientists now studying at the University of Wisconsin—states the University of Wisconsin News Service.

The two men—Mr. Victor Morris and Dr. Thomas Walker—are among 50 persons from the United Kingdom now attending American universities or working in American industry, principally to study American technology. Both will spend part of their two-year scholarship period at the University of Wisconsin and part at work in industrial organisations, learning first-hand the technical operations that can be of value to Britain.

Practical Experience

Mr. Morris, 21, who was awarded his B.Sc. degree at the University of Leeds, plans to divide the time evenly between Wisconsin and a chemical organisation, while Dr. Walker, 25, who has a doctorate of the University of Glasgow, will leave, after a semester at Wisconsin, for practical training in a pharmaceutical house.

Mr. Morris was working at I.C.I., Ltd., Runcorn, and Dr. Walker was engaged in drug research for the Glaxo Laboratories, Ltd., London, when their Marshall plan scholarships were granted.

"Although Britain and the U.S. are about equal in basic or pure research," Dr. Walker said, "the U.S. is somewhat faster at putting new research findings to use, in bringing new drugs, for example, up from the laboratory and into production."

Royal Society Recognition

THE following were elected foreign members of the Royal Society at its meeting in London last week: Dr. WALTER SYDNEY ADAMS (Pasadena) who is distinguished for his contributions to solar and stellar spectroscopy; PROFESSOR CARL FERDINAND CORI (St. Louis), noted for his work on metabolism of carbohydrates in the animal body; PROFESSOR ENRICO FERMI (Chicago) who has made important contributions to theoretical and experimental physics, especially in statistics and the properties of slow neutrons; PROFESSOR CARL JOHAN FREDRIK SKOTTBERG (Gothenburg), who has made notable contributions to the study of the geographical distribution and taxonomy of plants.



Mr. Victor Morris (standing) and Dr. Thomas Walker at the University of Wisconsin where they are spending part of their two-year scholarship period

Metal Price Changes

A FURTHER increase in the price of good soft pig lead by £2, from £86 to £88 a ton, delivered, was announced by the Ministry of Supply last week.

The maximum price of basic pig-iron was increased, as from May 1, under the control of Iron and Steel (No. 78) Order, 1950. This is an adjustment within the steel industry and the price of pig-iron and steel to outside consumers will not be affected.

An immediate increase in the price of good ordinary brand zinc was announced by the Ministry of Supply on Tuesday last, May 2. The price was raised by £2, from £95 10s. to £97 10s. a ton delivered. Prices of zinc oxides were raised by £1 15s. a ton as follows: Red seal from £91 to £92 15s.; Green seal from £92 10s. to £94 5s. and White seal from £93 10s. to £95 5s.

165 Student Technologists

Over 165 textile students at centres in all parts of the world are expected to sit for the Textile Institute's examination in general textile technology on May 20.

PARLIAMENTARY TOPICS

Projected Oil Refineries

REPLYING to a question regarding the building of an oil refinery at Tynemouth, Mr. P. Noel-Baker, Minister of Fuel and Power, said that the project had been approved in 1947. To make necessary provision for the refinery in the capital investment programme for 1950, the firm had recently been asked when it hoped to begin building. The firm stated it would not be able to start this year.

FACTORY Inspectorate vacancies were again the subject of questions in the House. Mr. G. Isaacs, Minister of Labour, stated that there were at present 51 vacancies and two open competitions were being held this year with a view to filling them. In the last three years there had been some 90 recruits. Other points raised were whether the starting salary of £350 a year for a graduate of 21 or 22 was adequate to attract the right type of man, and whether any preference was given to ex-service men over 40 years of age.

EXCHANGE of scientific data between British Guiana and the neighbouring Latin American Republics and French and Dutch territories, was raised by Mr. Peter Smithers. In reply Mr. J. Griffiths, Secretary of State for the Colonies, said that following a visit of the Governor of Surinam and the Prefect of French Guiana last year, there had been a useful exchange of information between technical officers of the three governments. Similar visits had been arranged with Brazil and Venezuela. Opportunities to exchange scientific data were also provided by the Caribbean Commission, and through international technical conferences in Central and South America.

ASSURANCE that iodisation of salt would neither affect the taste or the price, was given by Mr. M. Webb, Minister of Food, in reply to a question from Mr. Hugh Fraser.

THE Minister of Supply stated on Monday, May 1, that he was not at present prepared to abandon bulk buying of lead as the relative abundance of the metal might prove to be only temporary. He was not yet prepared to disturb the existing arrangements which enabled us to obtain maximum supplies of sterling metal and to control effectively the expenditure of dollars and other hard currencies. Selling price of virgin lead in the U.K. was no higher than in the U.S.A. and the chief continental countries.

(continued at foot of next column)

ABYSSINIAN OIL SEEDS

Increase in Exports

EXPORTS of oilseeds from Ethiopia (Abyssinia) increased from 476 tons in 1946 to 14,772 tons in 1948—according to returns of the Franco-Ethiopian Railways. The principal oilseed at present is linseed, followed by sesame and nug, the last being uniquely an Abyssinian product. It is a very hard and extremely small seed, about 200 weighing a gramme. Its oil content is 36-38 per cent.

For 1949, the exports will have been much larger; during the first quarter alone they amounted to 12,000 tons carried by the F.E. Railways.

M. Stephane Guyot has given an interesting illustrated account (*Oléagineux*, December, 1949, pp. 715-719) of further possibilities in this country of 10 million people, still primitive but much more amenable to training, especially in agriculture, than many other African peoples. Manufacturing industry on the cottage or village scale, as in India, would probably suit the majority better than large factories of the European type. Much of the country is fairly fertile, and oilseeds should provide 200,000 tons for export in the course of a few years.

Manx Seaweed Processing

A Manx Government Commission investigating the commercial use of seaweed stated in a report published last week that the collection and processing of button wrack could be developed into a profitable off-season industry.

WHAT progress was being made with the mining or brine pumping of the potash deposits near Whitby, was asked by Colonel R. S. Clarke. Deep boring to prove and determine the extent of the deposits has been in progress during the last 12 months replied Mr. H. Wilson, President of the Board of Trade, but considerably more investigation was necessary before plans could be made for working them.

COMPARATIVE figures for the carbon content of the atmosphere in Stoke-on-Trent and Nottingham, were asked for by Dr. Barnett-Stross. No such figures were available, replied Mr. Herbert Morrison, Lord President of the Council, as although measurements of smoke and deposited matter, including carbonaceous matter, were sent to the DSIR by the city of Stoke-on-Trent, no such reports were at present made by Nottingham, but observations were to begin shortly.

BRITISH CERAMICS PROGRESS REVIEWED

Jubilee Celebrations in the Midlands

MORE than 400 members of the British Ceramic Society met on April 25 at Stoke-on-Trent to celebrate the 50th anniversary of their society. They included scientists and technologists engaged in the pottery, refractory materials and allied industries and visitors from overseas.

An extensive 3-day programme arranged by Dr. A. T. Green, the general secretary, included civic receptions, works visits, exhibitions, and the reading of technical papers by leading scientists.

Following the reception at Stoke Town Hall by the Lord Mayor, who delivered a brief address of welcome, the society's president, Mr. M. S. Whitehouse, outlined the work and progress of the three sections (pottery, refractory materials and building materials).

On April 26, the three sections held separate meetings to hear and discuss papers. The pottery section meeting was held at the North Staffs. Technical College, Stoke-on-Trent, and the building materials and refractory materials sections met at the Palace Hotel, Buxton.

A paper entitled "Fifty Years of Progress in Ceramic Whitewares" was read to the pottery section by Dr. W. L. German and W. L. Ratcliffe.

Little change had taken place in the preparation of ball clays, the authors said. In the past few years the production of dried air floated clays had been begun, although, as yet, there was no sign that the majority of potters regarded the increase in cost as worth while. This contrasted with the U.S. practice in which dry ground clays were essential for the dry mix process.

China Clay Research

Considerable research had been carried out on the properties of china clay, and centrifuging was now being adapted to control the grain size of various grades. De-watering was done extensively with filter presses, instead of the heated floor kiln.

During the past ten years, investigations had shown that a change in the specific gravity of flint occurred on calcination at temperatures as low as 300° C., with only a slight change in value up to 900° C. The alteration in specific gravity at the low temperatures was due to liberation of water and not to any change in the flint to cristobalite, as was previously thought.

The grinding of flint and stone in pans was now tending to change over to cylinder grinding. The latest development was the "closed circuit" method, in which the material was continuously removed from a cylinder and its grain size checked with a classifier.

In the preparation of bodies for white-ware, dry and wet methods of mixing were still used, with the dip stick as the measuring device. Steel presses were taking the place of wood, and nylon press cloths had been introduced. De-airing pugs were more widely used and improvements had been made in the design of lawns and magnets. The addition of small amounts of ball clay, bentonite, and Florida kaolin to the bone china body (to allow working with machines) was now more widely practised.

Lead Poisoning

Recalling that in 1898 there were 457 cases of lead poisoning reported in the industry, the authors said that the pottery regulations of 1918, and the introduction of low solubility glazes greatly reduced the incidence of the disease. In 1949 no cases were reported.

Much had been reported on the effect of certain materials on the solubility of lead frits. Alumina and titania had a marked effect on reducing the solubility, boric acid showed a high solubility. An important contribution to the solubility of frits was made in 1948 by H. L. Podmore; he coated the frits with an insoluble material and thus enabled a frit of high lead content to pass the Government solubility test.

The importance of viscosity and thixotropy in glaze control had begun to be appreciated. Glaze control was now, roughly speaking, the control of differential sedimentation of heavy or large particles and the attainment of the correct thickness of glaze by control of viscosity and thixotropy.

In the U.S.A. the trend had been to use pyrophyllite and talc for the construction of bodies, but these materials had not made much headway here because of their high cost.

In his paper "Developments in the Manufacture of Silica Bricks," Mr. R. T. Lynam referred to the origin and historical background of silica brickmaking, and reviewed the conditions and methods of manufacture during 1900-25. He empha-

sised the importance of the Workmen's Compensation (Silicosis) Act of 1919, and described its contribution to present hygienic conditions in the industry.

From 1920, the speed of development had increased with the adoption of silica products for use in the carbonising industries, especially for coke ovens. An important event was the founding of the British Refractories Research Association, which considerably strengthened the scientific approach problems concerning the manufacture and use of silica.

On the final day of the celebrations, papers were read at the North Staffs. Technical College on the subject of education in the ceramic industries. One of these was "The Universities and Ceramic Education," by Prof. A. L. Roberts, of Leeds University.

At university faculties, the professor said, men were given sound preliminary training in pure science and engineering, followed by systematic instruction in applying that science to specific industrial fields. This was the true technologist, the man who approached his subject through the study and application of the

underlying science and not by first learning the operating technique.

Prof. Roberts considered there was no general case for the establishment of new technological institutes or for dissociating technological departments from the universities. The number of technologists could be sufficiently increased by expansion of the universities. A few new technical colleges might be necessary in certain cases.

There were in Britain no immediate facilities for first degrees in ceramic technology. This was in marked contrast to the position in the U.S.A., where some 250 graduates were produced annually. In Prof. Roberts' opinion degree courses were urgently required. The needs of the industry would not be met by men with post-graduate qualifications.

He had therefore proposed to the University of Leeds that a course leading to the degree of B.Sc. with Honours in Ceramics should at once be instituted. The course would cover four years following matriculation. His proposals had still to be ratified by the Senate and Council of the University.

Carbon Monoxide Detector

A NEW instrument for the detection of carbon monoxide in the atmosphere has been developed at the National Research Council of Canada.

The detector, which weighs only a few pounds, is the result of the collaboration of Dr. Morris Katz and Dr. John Katzman, both of Ottawa. The general idea is not new, but there are important differences in the utilisation, developed by Dr. Katz, of silver permanganate laid on a zinc oxide carrier. This agent is unaffected by water vapour in the air being tested, so that drying agents are not needed. Such agents normally lose their effectiveness fairly quickly.

The effect of the new equipment is to change the carbon monoxide into carbon dioxide. The heat generated in the process is transformed into electrical potential and measured in terms of millivolts. Measurement of the electric potential is stated to give an accurate record of the amount of CO which is recorded by a simple calibrated gauge on the front of the detector.

The Katz-Katzman portable carbon monoxide detector is stated to be able to measure CO contamination as small as 3/2000 of 1 per cent.

The instrument takes up only a few feet of space. Included in the make-up is a

small cell containing the chemical, the calibrated millivolt metre and a small battery-operated pump which propels the air into the detector.

Final improvements are being made to the detector, and it is expected that the right to manufacture the instrument will soon be made commercially available.

Fertilisers in Spain

IN recent months the pages of *ION* have been much occupied with the subject of fertiliser manufacture in Spain. Further news on the subject is contained in the last issue to hand (March), describing the opening of the new factory of NICAS (Nitrates de Castilla, S.A.) in Valladolid, by General Franco and Ministers. The capacity will be 32,000 tons in the first stage and 64,000 tons per annum in the second. It is stated that the first stage will begin within a short time.

This new enterprise has been capitalised at 100 million pesetas. Electrolytic hydrogen is to be used with atmospheric nitrogen from air liquefaction, by the known methods which are described, also for the synthesis of ammonia, nitric acid, and ammonium nitrate. This latter will be mixed with calcium carbonate, and the nitrogen content will be 15.5 per cent.

The Future of Analytical Chemistry

Instruments and Training for Industry

by CECIL L. WILSON, M.Sc., Ph.D., F.R.I.C.

WITH increasing frequency, analytical chemists are asking themselves questions regarding the future trends of their branch of science. Relegated for many years to the rôle of a rather unimportant handmaiden, analytical chemistry was almost static and little thought of, except by the faithful few.

The last ten years have seen a dramatic upheaval, and one which is clearly still in progress. This has resulted in an urgent demand for many more analytical chemists than the various sources of supply are likely to be able to provide for some time to come.

Because of the sudden demand, and of the uncertainty as to the way in which analytical methods are likely to develop, the sources of supply are themselves perplexed regarding what they are required to supply, while those on the receiving end are in large part dissatisfied with what is delivered to them.

Although the phase of development is still continuing, and leaders in the field may have divergent views on many aspects of the eventual issue, certain fundamental principles are emerging, and have been stated in varying terms by a number of writers and speakers on this topic on both sides of the Atlantic.

Instrumental Methods

When one examines recent trends, it is clear that one of the major factors, perhaps the most important one, is the place of instrumental methods of analysis in the industrial laboratory, and hence in analytical training. It was very fortunate that the pressing need for the increased help of analytical chemistry during and since the war years should have been almost contemporary with, or, indeed, slightly preceded by an equivalent expansion in the application of instruments to analytical problems.

The few isolated but notable examples of important advances in analytical chemistry in the 10 to 15 years prior to the last war almost all resulted from the introduction of instrumental techniques; polarography and various forms of electro-metric titrations spring particularly to mind. These advances undoubtedly not only served in their own spheres, but performed a wider function in making the

analytical chemist instrument conscious. To this new attitude of mind must be attributed, in considerable part, the two lines along which instrumentation developed in the analytical laboratory.

In the first place, there was a marked increase in the applications of instruments which were already familiar to the analytical chemist: the spectrophotometer, for example, came to the fore as a general analytical instrument rather than, as hitherto, the weapon of a few specialists.

Measuring Physical Properties

As a second line, and one which was rather more bewildering, there was the development of new instruments, or, more precisely, the application of instruments which were already valuable for other purposes to analytical processes; electron microscopy, X-ray methods and mass spectrophotographic analysis may be classed in this category. In other words, the analytical chemist was made fully and clearly aware that the measurement of any physical property, and not merely the measurement of mass or volume, might be a function required of his department. It is probable that this general statement of the scope of the analytical chemist's work was only rarely appreciated ten years ago.

Because of this development of instrumental methods, it is no surprise to find that in the recent valuable reviews published in *Analytical Chemistry*, such methods of analysis take up at least half of the space allotted to the survey of the whole field of modern analytical chemistry. It is equally pertinent to the discussion to comment that any higher training of chemists which omits to introduce its students to quite a range of these techniques is consequently failing in its duty.

These developments constitute some of the factors which lead the analytical chemist to look critically at the future. With inevitable over-enthusiasm, some have taken the view that instrumental methods must sweep the field. A fairly recent report of a symposium on analytical chemistry is illustrative of this point of view. The symposium, it was stated, was a "graphic demonstration of the progressive spirit of the modern analytical chemist, and pointed at the radical changes

that have been made in methods of analysis during the past ten years. There was not a single mention of a burette or a crucible in the entire programme. The procedures described were rather characterised by one speaker's jesting comment that 'after all, one just has to have some electronic mechanism in an apparatus these days.'

This is indeed an unfortunate view to publicise, for it is a half-adherence to this attitude that is responsible for most of the confusion that has arisen in the minds both of those training and those requiring analytical chemists. If, as a hasty and ill-founded survey may suggest, the classical methods are out-moded, and the practice of analytical chemistry is to be conditioned by a collaboration between electronics engineers and a team of button-pushers who need only be trained in the tricks of pushing their own particular buttons, then analytical chemistry might well be superannuated, and disappear from the chemical curriculum.

Modern Advances

Fortunately, the saner view has been explicitly stated by many in authority, and it is reassuring to find that if, in the most recent of the *Analytical Chemistry* surveys, half of the space is devoted to instrumental methods, the remaining half is concerned with modern advances which cannot strictly be called instrumental. It is clear that while the analytical chemist has become instrument conscious, he has also become aware that there are other ways in which he may achieve both fundamental and applied advances.

The sections devoted to inorganic volumetric and gravimetric analysis, and to inorganic micro-analysis, are among the largest in the reviews, and indicate that a very large bulk of research on what may nowadays be called classical methods still continues to appear.

In addition, and this is an interesting and encouraging phenomenon, there are several techniques, not necessarily instrumental, which have been applied successfully to a growing number of problems. Outstanding among these is chromatography, with its well-known successes, and to this must be added its offspring, paper chromatography which, in the past few years, has come to the fore as a technique widely applicable to both inorganic and organic problems. Again, ion exchange methods are increasingly common, and indicate the receptivity of the analytical chemist to new ideas as well as to new instruments.

It would be unduly pessimistic to assume

that analytical chemists have reached anything like the bottom of the bag in respect of non-instrumental techniques. Writing on instrumentation, Müller³ says: "The advances in instrumentation continue to be derived from every branch of science and technology, and they all hold promise for the solution of the analyst's problems. It is particularly profitable to seek suggestions for new analytical techniques in wholly unrelated fields, and this is possible especially if one examines new developments in the light of their instrumental possibilities."

While Müller directs his thesis to an instrumental context, it should be stressed that the statement is equally applicable to non-instrumental methods. It is probably easier to recognise the potentialities of an instrument than those of a non-instrumental process. But the rapid development of partition chromatography, particularly in separations on paper, should be a clear reminder that the dodge of to-day may be the technique of to-morrow, if it is spotted by a worker with insight.

If we take this view, it is then possible to hold with Murphy⁴ that while "we may rejoice that recognition by analysts of the latent possibilities of instrumentation has brought about a renaissance in analytical chemistry . . . I do not believe, however, that the classical methods will be abandoned . . . instrumentation will not supplant, but will rather supplement, wet methods." This being so, it may then be possible to crystallise certain views regarding the future of analytical chemistry which will be some guide to the attitude which must condition our approach more immediately.

An Educational Problem

In the first place, we must accept the fact that instrumental methods of analysis are here to stay. They are of importance, and every analytical chemist, no matter how much he may have nostalgic leanings towards classical methods, must learn to make the best use of the instruments available. The primary problem which this raises is an educational one, and on this various pertinent statements have recently been made.

Most of the analytical chemists of to-morrow will work in the industrial field. While certain fundamentals will hold for all of these, their attitude to analytical problems, and their opportunity for variety of approach, will depend to a considerable extent on the apparatus which the budget of their firm can make available to them.

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Certain instruments are, or must shortly become, a part of the standard equipment of every analytical laboratory. The polarograph and the photoelectric absorptiometer, for example, are so widely used, and have such potential value for most branches, that one must regard them as falling within this category.

On the other hand, it would be a mistake to suppose, as some have done, that each analytical laboratory must have every analytical instrument available. Both the direct cost of the instrument and, in many cases, the necessity for specialist staff, must preclude this. Many laboratories will never require a mass spectrograph, and may well be able to solve their problems satisfactorily and expeditiously without recourse to X-ray methods of analysis. The nature of the problems met with most frequently must determine the need for the more expensive instruments of this type.

It would, equally, be false economy for laboratories carrying out certain types of analysis daily to decide against equipping themselves with elaborate spectrographic equipment on the grounds of initial or running cost. J. R. Churchill has stated¹ that 80 per cent of his company's metallurgical analysis is now done by spectrographic methods, the time factor being correspondingly reduced. Again, many laboratories find that not only is X-ray analysis the easiest answer to certain of their requirements, but it is additionally valuable in providing them with information which they would otherwise miss.

Range of Apparatus

One must conclude, therefore, that while the range of apparatus in the analytical laboratory will increase appreciable in the fairly near future, it will do so selectively. The attitude towards the extension will vary from laboratory to laboratory, and will be notably different in laboratories attached to small firms and those which serve large organisations.

This realisation enables one to look more realistically at the problem of teaching instrumental analysis. Any aspiring analytical chemist, during his training period, should become familiar with the principles and practical use of those instruments most likely to achieve the status of standard equipment. At the present time it might be difficult to set up an unexceptionable list of such apparatus. Without making any claim to infallibility, however, one might suggest that this would include the absorptiometer, the microscope, the polarograph, the refractometer, the spectrograph, together with a selec-

tion of instrumental methods for electro-metric titrations and electrodeposition.

In addition, the principles of other more elaborate instrumental methods and their fields of application should be studied. It might even be advantageous if some slight knowledge of the practical aspects of at least one of these were acquired. In the meantime, the aspiring analytical chemist must never lose sight of the classical basis of analytical chemistry, with its equivalent importance. He must acquaint himself with the principle and practice of the newer non-instrumental techniques. He must have more than a nodding acquaintance with the development and trends of classical micro-analysis as distinct from analysis on the ordinary scale. Above all, he must have his mind made and kept alive to the possibility that on the morrow some chance observation of his, some random coincidence of apparatus or methods, may, if his mind is sufficiently receptive and fertile, add yet another tool to the armoury of analytical research.

Training Courses

Recently, in discussing the training of analytical chemists for industrial research, Stillmann² has outlined the requirements of a training course as he sees them, and some of his points may usefully be stressed by repetition here. The basic principle, he claims, and one which many writers have emphasised, is that the course should be based on the fundamental principles of chemistry and physics. Each part of the course, whether qualitative, quantitative, or instrumental analysis, should be chosen primarily to illustrate principles, to show why certain steps are taken, to avoid turning the student into a slave of procedural detail.

With particular reference to instrumental analysis, Stillmann maintains that "the emphasis should be on the principles of design and operation of the instruments and on the development of adequate interpretations of the data obtained from the instruments. The objective of a survey course should not be to develop a finished instrument operator. Such skill is easily attained with practice. Rather, the student should receive a clear impression of each type of instrument so that he knows its field of application together with some of its advantages and some of its disadvantages."

This emphasis on fundamentals rather than on details means that the production of first-rate analytical chemists of the future must be a matter of co-operation in a way that has not, in the past, always

been achieved. As Stillmann says, "There should be no fore-ordained plan to turn out, at the end of four years, a complete analytical chemist. Rather there should be presented to the student the basic knowledge in the sciences of chemistry and physics upon which as foundation he can build later, either through graduate study or through actual experience in the laboratory while practising his profession."

Consequently, a co-operative industry will not expect that its intake should immediately be able to cope with industrial analytical research problems, perhaps in a specialised field. It is, however, fully entitled to expect that the basis on which the prospective analytical chemist can build should already have been supplied. This, often, is not so.

Necessary Qualifications

Too often the student training in analytical chemistry is of the cookery book type, with no regard to reasons. Solution A is added to solution B at a prescribed rate, conditions of temperature as laid down are closely adhered to, incineration and weighing follow the printed word precisely, and the student hands in a correct determination, which is worth exactly nothing apart from proving an ability to read a set of directions accurately and to follow them implicitly, which are the qualifications of a technician, and not of a research chemist.

More than in any other branch of chemistry, there has been in analytical training the disastrous tendency to box theory and practice in different compartments in the student's mind. Eynon, in his retiring address as president of the Society of Public Analysts¹, put his finger on one of the reasons for this, and one of the necessities if it is to be rectified, when he called for longer periods of training for analytical chemists and for the establishment of chairs in this branch.

Only when the subject takes its place as an equivalent partner with physical, inorganic and organic chemistry will it be fully realised by both partners in the co-operation, the training institutions and the industrial employers, that analytical chemists cannot be mass-produced from semi-skilled raw material.

The editor of *Analytical Chemistry* has made statements² which show that in America these problems are realised with equal force.

As far as this country is concerned, it is fortunately the case that since the war the financial aspect is the least pressing, owing to the important support being

given by the Government to the universities, but the need for staff able to integrate fundamental analytical training in a comprehensive undergraduate course is acute.

The lack of a general appreciation that analytical chemistry must be developed in the universities to a pitch far beyond any yet achieved is still woefully obvious. It must be clearly realised that the staff involved are primarily concerned with the fundamentals of analytical chemistry in a broad training course, and are not inorganic or physical or organic chemists who are prepared to mention analytical problems in passing. On the other hand, they are concerned to indicate to the student that analytical problems in turn are interlinked with all the others.

In this way, by the time the student has acquired a degree or an equivalent qualification, and only then, is he in a position to decide that he will specialise in analytical chemistry, if he prefers it to physical chemistry or organic chemistry. It is as necessary that the physical or organic chemist-to-be should have some appreciation of analytical chemistry as that the analytical chemist be familiar with the background of those who should be his collaborators. From that point, specialisation, met by provision of post-graduate courses in analytical chemistry and by post-graduate schools, will follow.

A Long-Term Proposition

The need for correlation between industry and training establishments will thus be seen to be a matter for both sides. The training establishments must realise clearly what is required, and must set themselves to a reorganisation which will enable the demand to be met. Industrial organisations, for their part, must be prepared to explain precisely what they require. They must, if necessary, be prepared to assist in its provision, both by financial support, and, quite frequently, by the provision of staff who are alive to the requirements by experience, and who are first rate teachers. Finally, they must patiently avoid expecting an immediate return in what is essentially a long-term re-orientation of the universities and higher technical colleges to the place of analytical chemistry in the training of a chemist, and the function of the analytical chemist in chemical industry to-day.

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HEPTAFLUOROBUTYRIC ACID

A Likely Intermediate in Fluorine Chemistry

By A SPECIAL CORRESPONDENT

A GOOD deal of research has recently been carried out on the fluorination of aliphatic acids, and one of the latest of the completely fluorinated reactive acids is heptafluorobutyric acid ($\text{CF}_3\text{CF}_2\text{CF}_2\text{COOH}$). This is a very strong and highly corrosive acid possessing a sharp odour very similar to that of butyric acid. It is a colourless, fairly heavy liquid (density $\text{g/cc. } 1.641$ at 25°C.) having a boiling point 120.0°C. (735 mm.) and freezing point -17.5°C.

The vapour pressure of the fluorinated acid is 44 mm. at 56°C. ; 455 mm. at 107.4°C. and 735 mm. at 120°C. ; surface tension is 15.8 dynes/cm. (30°C.). It is miscible with water, methanol, acetone, ether and petroleum ether, slightly soluble in xylene and heptane, and very soluble in carbon tetrachloride and benzene.

So far no major application has yet been found for heptafluorobutyric acid, but it is expected that it will find its greatest outlet as an intermediate in the new fluorine chemistry. Work carried out in the U.S.A.—notably by the Minnesota Mining and Manufacturing Company—indicates that owing to the low surface tension of the acid, and therefore its high penetrating power, there is a possibility of utilising it for introducing the hydrophobic heptafluoropropyl group into organic molecules, and so preparing a very wide range of fluorinated compounds.

The Esters

A number of esters can be prepared from the fluorinated acid. The simplest, methyl heptafluorobutyrate, has a boiling point of 79°C. (737 mm.) and a melting point -86°C. , and the most complex, 1-3-Bis (heptafluoro-butyroxy)-2-ethyl-hexane, a boiling point of 145°C. (35 mm.). The polymerisable ester, vinyl heptafluorobutyrate, which is obtained by the catalysed addition of heptafluorobutyric acid to acetylene, has a boiling point of 79°C. (748 mm.).

Some of these esters are prepared in good yield, for example, ethyl heptafluorobutyrate can be obtained in 83 per cent yield (crude) by reacting with ethyl alcohol in the presence of hydrochloric acid, and the methyl ester in 89 per cent yield by reaction of the acid with an excess of methanol in the presence of sulphuric acid.

All the usual derivatives of aliphatic acids can be prepared from heptafluorobutyric acid, and some appear to have interesting commercial possibilities. The alcohol, 1, 1-dihydro-heptafluorobutyl, formed by reduction of heptafluorobutyric acid or its derivatives, is comparable with phenol in acidity and resists conversion to an alkyl halide. It can be esterified under conditions used for a phenol. The alcohol has a boiling point (750 mm.) of 95°C. Esters can be prepared from this alcohol and the acrylate is of particular interest for the manufacture of fluorinated acrylic resins. The acrylate derivative has a boiling point of 43°C. (40 mm.).

Amines

A fluorinated amine, 1, 1-dihydroheptafluorobutylamine, can be prepared from heptafluorobutyronitrile and heptafluorobutyramide by the reductive action of lithium aluminium hydride. The amine has a boiling point of 68°C. (743 mm.) and bears a closer resemblance to aromatic than to aliphatic hydrocarbon analogs. It is a relatively weak base. The amine hydrochloride has a melting point of $130-135^\circ\text{C.}$, at which temperature it sublimes.

Diazotisation in a dichloroethyl ether-water system at low temperature has been accomplished. The derivative bis (1, 1-dihydroheptafluoro-butyl) urea has a melting point $118-9^\circ$. By utilising the Grignard reaction it is possible to obtain the olefin, 2-heptafluoro-propylpropene, from the ester, methyl heptafluorobutyrate, by first reacting with methyl magnesium iodide to obtain the carbinol and then dehydrating this to make the olefin. This has a boiling point 53.6°C. (733 mm.). The compound 1, heptafluoro-propylethanol can be prepared by subjecting heptafluorobutyraldehyde to the action of methyl magnesium iodide.

Heptafluorobutyric acid forms a number of metallic salts, the most interesting being those of lead, silver, calcium, lithium and sodium. These are all very soluble in water and in several organic solvents. Lead heptafluorobutyrate is soluble to the extent of 493 grm. in 100 grm. of water and the lithium salt, 403 grm. in 100 grm. water.

The acid is difficult to handle, being highly corrosive to the skin, highly toxic and very corrosive to metals.

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Metallurgical Section

6 May 1950

GROWING FIELD OF RESISTANT METAL

Commercial Review of Technical and Economic Facts

LIGHT on the widening uses of the primary metals, wrought and cast products and alloys, has been provided by the International Nickel Company of Canada, Ltd.

This expert and far ranging review of many of the factors which have influenced the metal markets and metal-using processes in the past year was given by the company chairman, Mr. Robert C. Stanley, at the I.N.C. annual meeting in Toronto last week. He dealt at length with current operations concerning nickel, monel and the precious and semi-precious metals which enter largely into chemical processes and metallurgy, with which the group's plants in Britain, Canada and the U.S.A. have been principally concerned.

Since last July all separation of nickel and copper by the I.N.C. has been carried out by the matte flotation process, in preference to the Orford process.

Nickel is now being used in more than 3000 ferrous and non-ferrous alloys to impart one or more of its characteristics to them. The percentage of nickel in the alloys ranges from 99.7 per cent in malleable nickel to 0.20 per cent in a hardenable silver alloy.

Nickel Applications

Nickel thus finds its ways into a very great number of industrial applications. In the United States, Canada, and Great Britain the steel mills take approximately a third of the total, including substantial amounts for stainless steels. Deliveries of high nickel content rolling mill products and nickel for electro-plating together account for about 40 per cent.

Somewhat smaller percentages are used for grey iron, steel and non-ferrous castings, heat and electrical resistance alloys, nickel silver and cupro-nickel, magnets, batteries, chemical products, coinage, and other miscellaneous alloys.

At a time when there is great interest in cobalt for products such as alloys for jet engines, medicinal, and other applications, the cobalt recovery at Port Colborne,

Ontario, is being increased. The cobalt is sold principally overseas either as oxide or as salts, produced by the Clydach refinery in Wales.

The extension of television service and reorganisation of telephone systems on the Continent are providing opportunities for the further application of appropriate grades of iron powder.

The company continues to be an important producer of platinum metals, supplying world markets with platinum, palladium, rhodium, ruthenium, and iridium, which are recovered as by-products of nickel and copper refining.

Platinum Values

The markets for platinum metals are principally in the United States, where approximately half of all the platinum metals are used for chemical and electrical purposes. In these industrial services, the platinum metals have demonstrated economic advantages, the high initial cost being largely offset by a high value in the form of scrap.

The European market for platinum metals has grown with post-war reconstruction. Consumption has increased especially in the dental, electrical, and chemical fields. In 1949, manufacturers of dental alloys greatly increased their consumption of palladium.

The United States and Canadian production of alloy steels, other than stainless, was somewhat lower in 1949 than during the preceding year, but no significant changes were observed in the metallurgical pattern of these steels. More than 40 per cent of the total tonnage was estimated to have contained nickel.

Steels containing varying percentages of nickel continue to find wide use in motor vehicle, locomotive and many other engineering processes.

Progress has been made in engineering by specifying the use of 8½ per cent nickel steel for service at liquid air temperatures and several pressure vessels have been made and installed in commercial plants.

The prospect of increased use of commercial oxygen in large volumes in the metallurgical and petrochemical industries indicates a continuing demand for this steel which gives high strength and great toughness at these frigid temperatures.

The character of the stainless steel markets has remained much the same during recent years and important outlets included the chemical, petroleum, and food processing industries, transportation equipment, and the home appliance fields.

However, new uses are found each year and one of general interest during the year was the completion at Schenectady, New York, of a building with stainless steel walls. An extension of this field of application may provide additional outlets for the popular 18-8 chromium-nickel types.

The nickel plating industry ranks third as a user of nickel. The automotive industry accounts for the largest consumption of nickel for plating purposes.

Atmospheric Conditions

Long-time atmospheric corrosion tests are being completed which demonstrate the advantages of heavy coatings of nickel on steel to resist a wide variety of atmospheric conditions encountered by motor vehicles.

In the field of alloy cast irons, an upward trend of use was observed in speciality products such as Ni-Hard in mining equipment. Performance to date suggests that additional markets will be acquired with the expansion of operations in the beneficiation of iron ores. Following successful trials, Ni-Hard is being increasingly adopted for mill liners, grinding balls, etc., in the cement industry in Great Britain and elsewhere abroad. Particularly successful results have been obtained in India.

Demand for nickel for the corrosion-resisting cast irons remained at satisfactory levels. The aircraft industry uses substantial quantities of nickel in engineering and stainless steels, in heat-resisting alloys, such as Nimonic 75 and Inconel, mostly in sheet for combustion chamber liners and exhaust pipes, and other Nimonic alloys and Inconel X for highly stressed parts operating at elevated temperatures.

An example of the extent to which nickel-containing materials are employed in modern ship construction was afforded by the Peninsular and Oriental S. N. Company's 28,000-ton twin-screw passenger liner *Himalaya*, the largest vessel in the P. & O. Line's fleet. Monel and high nickel content heat-resisting steel were used for turbine blading. The latter material was also used for nozzle vanes, and gear pinions were made of nickel steel. Cupro-nickel was used for condenser and oil cooler

tubes, and substantial amounts of nickel silver were employed for ornamental and structural fittings.

Since 1881, in which year Switzerland had the distinction of issuing the first coin to be made of pure nickel, 42 countries have used pure nickel for 124 different coins. During 1949 Burma decided to employ pure nickel for the half and quarter rupee coins, the blanks for which were supplied by the I.N.C. British subsidiary, Henry Wiggin & Co., Ltd.

India has continued the issue of coinage in pure nickel and cupro-nickel, and during the past four years over 1000 million coin blanks have been produced for striking in India. The issue of the new coinage will not be completed for some years and will involve altogether many thousands of tons of nickel.

Television is using larger quantities of rolled nickel, with indications that the amount will continue to increase. Pure nickel is being used for the cathodes of the camera and picture tubes of television equipment due to its ability to retain its strength and stiffness at high temperatures (1650° F.) and also because it serves as an excellent base for the oxide coating which gives off the electrons.

In addition, the small amplifier tubes used in television transmitting and receiving equipment employ pure nickel cathodes, nickel or nickel plated anodes, and nickel grids and lead wires.

Lead Deposits in Derbyshire

A FURTHER rise in the price of lead announced last week gave additional interest to the report of Derbyshire Stone, Ltd., which, owing largely to the increased cost of lead during the last 10 years, is examining the prospects of developing large-scale working of lead-deposits in Derbyshire (THE CHEMICAL AGE, 62, 530).

The company's chairman, Mr. John Hadfield, told the general meeting of the company last week that the area available to them had recently been extended sufficiently to make it worth while to carry out extensive investigations of the quantities of lead ore which might lie there. Modern methods developed would reduce the difficulties resulting from depth and water.

An immediate examination aided by geophysical methods and boring was to be carried out by the Johannesburg Consolidated Investment Co., Ltd., in association with Derbyshire Stone, Ltd.

If results indicated that there were satisfactory quantities of lead ore, a company would be formed in which both parties would be substantially interested.

THALLIUM: A NEGLECTED ELEMENT

Some Increase of Industrial Applications

THALLIUM is one of the rare and relatively neglected elements that has recently assumed conspicuous importance. It is widely distributed in nature but occurs in such minute quantities in most rocks and minerals that its recovery at present is commercially feasible only as a by-product—in the form of its chloride in the flue dust—of other industries.

The unprecedented demand for products having special or unusual properties, created during the war, led to a study of a number of the rarer elements that previously had been given comparatively little attention because of the limited knowledge of properties, the small quantities present in available raw materials or the high cost of concentration and recovery.

The U.S. Bureau of Mines reports that it is studying the properties of such elements in greater detail, locating the most promising raw materials from which they can be derived, and working out methods of extraction that will render the recovery of the elements more economical. The last of the series dealt with titanium (*THE CHEMICAL AGE*, 62, 473). The new Information Circular 7553 is devoted to thallium.

Discovered by Crookes and Lamy in 1861, thallium's physical and chemical properties have been studied by several investigators, and although there was for a time some disagreement among them concerning the properties of the element and its compounds, these are now fairly well established and accepted.

Malleability

Thallium (Tl; a.w. 204.39; s.g. 11.85; m.p. 303.5° C.) is a heavy, soft, bluish-white metal resembling lead. In pure form it is quite malleable, but, although it can be extended, it is not very ductile and hence cannot readily be drawn into wire. It has a specific gravity close to that of lead and melts almost at the same temperature, but its boiling point is fully 125° C. higher than that of the latter metal.

Thallium may be distilled in an atmosphere of hydrogen or other reducing gas. It has a crystalline structure, and when bent gives off a sound similar to the "cry" of tin. Its hardness compared to that of lead at 1.5 is about 1.2.

It amalgamates with mercury and forms alloys with many metals. Lead-thallium alloys have a higher melting point than that of either metal alone. Alloyed with

silver or lead thallium greatly increases the corrosion resistance of these metals.

Although thallium resembles lead in many of its physical properties, it is more closely related to the alkali metals in its chemical properties and it is now generally agreed that it should be placed in Group III of the periodic table, along with boron, aluminium, and some "rare" elements.

Having a valence of 1 and 3 it forms both thallos and thallic compounds. The thallos salts are the more stable and have been studied more closely than the thallic compounds.

The Oxides

Oxidation of thallium in the air results in the formation of yellow thallos oxide (Tl_2O); but under more highly oxidising conditions, the dark-brown or violet thallic oxide (Tl_2O_3) is produced.

Thallium combines directly with the halogens, forming three series of compounds. In the case of fluorine, the action is so violent that the temperature of the product is raised to incandescence. In its monovalent state, thallium resembles silver and mercury, since it forms a relatively insoluble bromide or chloride and is precipitated by hydrogen sulphide. The sulphide, however, while very slightly soluble in water and alkaline solutions, is dissolved by dilute sulphuric acid.

Thallos hydroxide, carbonate, and sulphate resemble the corresponding compounds of soda and potash, since they dissolve quite readily in water.

On the other hand, thallium sulphate is readily reduced to metal by means of zinc and is far more stable than the alkali metals. Trivalent thallium compounds are more analogous with those of the aluminium family.

The comparative scarcity of thallium, the limited knowledge of its properties, and the high cost of extracting it from known sources hindered its commercial development.

Hence for approximately 34 years thallium continued to be more or less of a laboratory curiosity with few, if any, industrial applications. Its use in medicine began in 1896, but on account of its great toxicity was abandoned. Later, the use in highly refractive optical glass was proposed, which for a while represented the most important outlet.

(continued overleaf)

Several new uses were developed, particularly as a poison for rodents and later as an insecticide, and these have expanded rapidly within the past decade. Even at the present rather high prices thallium and its compounds can be employed to advantage for a number of commercial as well as scientific and military applications.

In conjunction with other metals, thallium forms alloys that have unique and valuable properties. Examples are lead-thallium, silver-thallium, and many ternary alloys. By far the largest proportion is consumed in compounds, for lenses, and photoelectric cells; in the glass industry to impart dark, opaque, black or brown colours as well as to increase density and provide an index of refraction higher than that of lead glass.

One of the more recent applications is in the manufacture of incandescent lamps. Thallous salts, being more stable than

thallic compounds, absorb traces of oxygen in such lamps and hence prolong the life of the tungsten filament.

Sources of thallium can be broadly divided into two groups: first natural occurrences, including deposits of thallium minerals, rocks containing small proportions of such minerals and water or brine with traces of dissolved thallium compounds. The secondary sources are industrial wastes and residues derived from metallurgical and chemical processes in which thallium from the original raw materials has been somewhat concentrated.

Since there are no commercial ores of thallium, the possibilities of extracting it as a primary product are extremely remote. However, in metallurgical and chemical operations designed to recover other metals and chemical products, thallium is often concentrated in flue dusts, precipitators, residues and mother liquors.

Production and Stocks of Non-Ferrous Metals

CLOSING stocks of non-ferrous metals in March were at a considerably higher level than in the same month of last year, and there was a marked increase in production, except in the gross output of main copper, alloy and products.

Consumption was also generally higher than in March 1949, and than in the previous month of this year. The monthly figures supplied by the British Bureau of Non-Ferrous Metal statistics give, among others, the following details:—

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS:		
Govt. and consumers' ...	33,348	85,969
Imports ...	10,648	16,049
PRODUCTION:		
Primary ...	—	9,305
Secondary ...	2,340*	6,275
CONSUMPTION:		
Primary ...	9,416	29,200
Secondary ...	—	17,246
Exports ...	2,473†	35
CLOSING STOCKS:		
Govt. and consumers' ...	34,663	81,219

* Rough Copper.

† Includes 1,336 tons of rough copper despatched to Belgium and 1,137 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products ...	26,099	..
Alloyed copper products ...	28,998	..
Copper sulphate ...	4,821	..

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS:		
Govt. and consumers' ...	33,258	48,210
Imports ...	4,764	9,495

PRODUCTION:		
Virgin and remelted ...	—	7,097
CONSUMPTION:		
Virgin (incl. debased) ...	8,779	21,738
Remelted and scrap ...	—	8,538*
Exports and Re-export ...	—	16
CLOSING STOCKS:		
Govt. and consumers' ...	29,243	45,136

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons		Lead Content of second-ary Scrap
	Lead in Concentrates	Imported Virgin Lead	English and Refined Residues
OPENING STOCKS:			
Govt. and consumers' ...	—	59,707	4,416
Other stocks ...	85	—	—
IMPORTS ...	—	13,567	166
PRODUCTION ...	279	—	8,156
CONSUMPTION ...	256	13,160	8,158
Exports ...	—	42	—
CLOSING STOCKS:			
Govt. and consumers' ...	—	59,169	5,420
Other stocks ...	108	—	—

TIN METAL

	Long Tons
GOVT. AND CONSUMERS' STOCKS (at end of period) ...	15,356
IMPORTS ...	1,082*
PRODUCTION ...	—
CONSUMPTION ...	2,140
EXPORTS AND RE-EXPORTS ...	681

* From January, 1950, includes imports of soft solder; if any.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS ...	363
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP ...	349

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM ...	44.90

MINERALS OF THE BELGIAN CONGO

High Production of Uranium, Cobalt and Tar

THE great variety of metals and minerals produced in the Belgian Congo and the Belgian mandated territory of Ruanda-Urundi, some of them in large quantities, includes copper, tin, zinc, cobalt, uranium, silver, tantalum, wolfram, cadmium, lead, manganese, tungsten, bismuth and platinum, besides gold and diamonds.

Stated to be the greatest producers in the world of uranium, cobalt and industrial diamonds, these territories also come high on the list of producers of copper, gold, tin and a number of other metals. A review of the commercial conditions of the Belgian Congo (HMSO 1s.) states that copper is the greatest single item in value in the list of Congolese exports (Fr. 3000 million in round figures in 1948).

The presence of all these mineral resources has been the main factor in the economic development of the country in the past and has contributed more than anything else to the Congo's rapid rise to prosperity. Not only do the mineral deposits provide in themselves wealth such as does not usually fall to the lot of a new, undeveloped and thinly-populated country situated, for the most part, at an enormous distance from the sea, but their exploitation has brought inestimable benefits in its train.

Location

Mining and mineral production is carried on principally in the high altitudes of the eastern and south-eastern regions, the great central region of forests and rivers having hitherto kept inviolate, with one exception, the secrets of any sub-soil riches it may possess; the exception however, is important, namely, diamonds in the basin of the Kasai river and its affluents. Mining is, naturally, entirely in the hands of big companies, the most important of which are: Union Minière du Haut Katanga (copper, cobalt, gold, tin, uranium), Société Forestière et Minière (diamonds and gold); Compagnie Géologique et Minière (tin); Société des Recherches Minières du Sud Katanga (manganese); Société des Mines d'Or de Kilo-Moto (gold); Compagnie Minière des Grands Lacs Africains (gold).

The following tables give the production figures for the years 1946, 1947 and 1948 for the Congo and Ruanda-Urundi:

		1946	1947	1948
Copper	... Tons	143,885	150,840	155,481
Cassiterite	... "	24,095	15,553	16,228
Tantalum	... "	163	139	141
Wolfram	... "	241	12	15
Tin (metal)	... "	2,410	3,125	3,937
Coal	... "	101,901	102,074	117,494
Cobalt alloys	... "	2,528	6,697	6,397
Cobalt				
(granulated)	... "	1,171	878	1,741
Raw zinc concentrates	... "	67,024	46,495	54,501
Calcined zinc concentrates	... "	21,761	25,895	27,892
Cadmium	... Kgs.	16,571	26,040	18,056
Lead ore	... Tons	—	1,675	1,002
Silver	... "	157	126	118
Manganese ore	... "	—	8,519	12,765
Bismuth ore	... Kgs.	—	1,040	652
Pig iron	... Tons	—	406	141

A comparatively advanced stage of industrial development is indicated by the figures of Congolese production of chemicals (43,882 tons in 1947 and 47,243 tons in 1948) and compressed oxygen (285,466 cu. m. in 1947, 347,675 cu. m. in 1948). The principal manufacturing firms concerned are: chemicals (Ciments du Congo, Thysville, and Société Industrielle et Chimique du Katanga, Jadotville), and compressed oxygen (Chanic, Leopoldville).

1950 Aluminium Supplies

THE Ministry of Supply announces that it has contracted to buy 96,000 metric tons of virgin aluminium from Aluminium, Ltd., of Canada, during 1950. Total imports of virgin aluminium from Canada during 1950 are expected to reach about 136,000 tons, comprising 96,000 tons from the new contract and about 40,000 tons under the 1949 contract. In 1949, when 161,000 tons were imported from Canada, stocks rose above the level considered necessary. During 1950 stocks will be reduced to the required level. These imports from Canada, together with aluminium from European and home production, will, it is stated, provide an adequate supply for the U.K. fabricating industry, which in 1949 used 181,500 tons; 300,000 tons of Canadian aluminium has been purchased by the U.K. with ECA aid.

Saar Iron and Steel

Pig iron output in the Saar in 1949 totalled 1,581,000 tons (1,134,000 in 1948); crude steel production amounted to 1,758,000 tons (1,122,000 tons), and rolled products 1,216,000 tons (819,000 tons).

Sources of Metal Corrosion

Association's Work on Copper, Aluminium and Alloys

THE prospect of considerable advances in knowledge of the causes and behaviour of metal corrosion are recalled in the current summarised accounts of the work of the British Non-Ferrous Metals Research Association. Much of its work in corrosion research during 1949 was concerned with the destructive reactions observed in copper, copper-nickel-iron alloys and aluminium.

Resistance to Pitting

Referring to these in its 30th annual report, the association confirms the belief that the resistance of copper to pitting in the presence of some domestic waters is probably due to a naturally occurring inhibitor in such waters.

An "artificial pit" has been devised in which a corrosion current flows when the liquid is a supply water known to be capable of causing pitting, while none flows when the liquid in the cell is a water known to be non-corrosive. The results of such experiments show a remarkably close correlation with the results of polarographic examination of the waters. It is therefore now possible to assess the likelihood of a given water being capable of maintaining pitting with much greater assurance than hitherto.

It is now becoming clear that the most important reason for the commencement of pitting in practice is the presence of a suitable cathodic film on the pipe surface, before the pipe is installed. Evidence has been obtained that such films only occur when certain manufacturing techniques are used, but their presence has been confirmed in 90 per cent of the failures brought to the association's notice.

It would seem that failure in cold water would be virtually eliminated if only clean tubes, free from cathodic films, were put into service and that this factor is far more important than the composition of the tubes.

The complicated nature of the current work on resistance to impingement of copper-nickel-iron (5-10 per cent nickel) has been disclosed by the association's experiments with standard condenser tube alloys. These have been subjected to jet impingement with water speeds up to 35 ft./sec., with up to 5 per cent of entrapped air. Practical recommendations have been produced regarding the effect when such tubes are re-heated to 600° C. Such heating, it is established, does not significantly reduce subsequent resistance to corrosion. The impingement experiments appear not yet to have produced any conclusive results, although certain trends are said to have been recognised. Attention is being paid now to the possibility of producing new alloys with heightened resistance to high water speeds.

Water Supply Effects

The association's corrosion studies of aluminium have already made it apparent that the presence in the water of traces of copper has a profound effect on the behaviour of the test pieces. In all cases corrosion attack is extremely localised. Part of this present programme is the comparison of the effect on commercial grade aluminium of differing natural water supplies. In members' laboratories tests are being carried out, using some six types of water of widely differing characteristics.

Pig-Iron International Scheme

TECHNOLOGISTS in chemistry, metallurgy, gas and from the oxygen producing industry forming a group from OEEC countries have been meeting to arrange the pooling of information and resources. A proposal was made to erect on an international basis a large pilot plant of new design to produce pig-iron and to develop the use of low-cost oxygen produced on a large scale.

Plans include iron and steel production, mining by gasification, and production of synthetic petrol, alcohol, and intermediates for other synthetics.

Jugoslav Copper Mining

INTENSIVE exploratory and expansion work is being carried out in the copper and pyrites mines of Majdanpek in Eastern Serbia, according to Jugoslavian reports. Recent prospecting is said to have shown that these mines, which were thought to be nearly exhausted, may eventually prove more important than the well-known Bor copper mines. Construction of a flotation plant is to be put in hand this year, to be linked with the mine by a standard gauge track, and electric power supplied from the Kostolac power plant.

ALUMINIUM DEVELOPMENT

Retarding Effect of Devaluation

CERTAIN major developments, which were to have been included in the 1949 activities of the Aluminium Development Association, have been in part suspended or delayed by the effect of devaluation, especially the rise in the price of imported material.

Although fruition of some of these projects may be retarded until the situation becomes more stabilised, this has not occasioned any slackening of the association's fundamental development work. These were among the facts offered by Mr. Kenneth Hall, the retiring president, at the annual general meeting, recently. In fact, he said, the interval was being profitably employed in achieving solutions to hitherto unsolved problems, such as riveting and welding of thick plate, or the fuller introduction of new techniques such as argon arc welding.

In research, the essential study of welding and joining, particularly as applied to argon arc welding and work on thick plate, continued to be pressed forward, and it would be noted that in riveting some success had been achieved with rivets up to $\frac{1}{2}$ -in. diameter.

Thin Copper Foil

AS a preliminary to commencing production in a new plant, it is announced by the Royal Mint Refinery, of 19 Royal Mint Street, London, E.1, that limited supplies of very thin copper foil are available from a pilot plant. This foil extends the range of commercially available copper down to 0.00012 in. in thickness.

At present the foil is supplied in sheets 30 in. by 5 in., but eventually it is expected that lengths of several hundred feet will be available in widths of $7\frac{1}{2}$ in. (18.5 cm.). The foil is of hard temper and is easily handled in spite of its thinness. Its electrical conductivity is 95 per cent I.A.C.S. minimum, and its chemical composition conforms to electrolytic copper standard. It is supplied with one side polished and may, if necessary, have one or both sides plated with gold, silver, nickel, zinc, cadmium or tin.

If required, light tested material free from pinholes can be made available in certain cases. It is expected that the advent of this material will open up new possibilities in many industries, particularly those dealing with the manufacture of printed circuits and electrical condensers.

SPAIN'S ALUMINIUM

Difficulty in Obtaining Machinery

THE importance of aluminium and its alloys has long been realised in Spain, and in recent years serious practical attempts have been made to establish a national industry in this field. On August 11, 1943, the Empresa Nacional del Aluminio, S.A., was established, with works near Valladolid. From an initial contemplated output of 1250 tons per annum it was proposed to increase to 2500, then to 5000-10,000 tons of aluminium. Many difficulties have hitherto delayed even partial realisation of these plans, including non-delivery of the requisite machinery ordered from Switzerland, inadequate electric power, currency troubles, etc., (ION, 1950 10, 139-142).

The site of the factory is near a number of electric power stations, and the importance of adequate (and alternative) power supply to keep the furnaces going continuously without risk of any cooling down is emphasised. The site is also fairly well situated as regards communications, being near the main Madrid-Irun railway and on the Madrid-Santander highway. The new enterprise has been financed by the Government through the Inst. Nac. de Industria—with majority participation—and the Soc. Española de Construcciones Electro-Mecánicas.

The process to be used is the generally known one, from bauxite by electrolysis. In the original article are shown the electrolytic plant with Söderberg carbon electrodes, gas recovery system, 5-ton furnaces for melting, series (6) of mercury vapour rectifiers 6-phase, 6250 amp., and general perspective view. Much of the plant is believed to have been supplied by the Swiss firm, Brown, Boveri Co. The rectifiers are Cooper-Hewitt type. The source of the bauxite employed is not stated.

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ACCOUNTS AND TAXATION

Ascertaining Taxable Profits of Chemical Processes

by S. HOWARD WITHEY, F.Com.A.

METHODS of account-keeping in the chemical and allied industries vary considerably, according to the nature of the products and the number and kind of processes employed. In addition to ordinary books of account—such as sales books, purchase journals, nominal and private ledgers, etc.—certain aspects of accountancy now have to be emphasised in order to ensure an effective internal check and control and to enable the management to ascertain the total cost of running the business.

Advertising

Demands for chemical products of standard and special design are reflected in the manufacturers' order book, and consequently the creation of sustained demands is a matter that calls for constant and scientific treatment. As competition becomes very much more acute, each manufacturer must adopt methods of advertising and publicity which have proved to be consistent business pullers, and a special book should be kept for recording the orders and instructions received, each entry giving the date, the customer's name and address, a detailed description of the products required, and the rate or price of each different kind.

Columns or sections are now usually provided in the order book for the insertion of the date of supply or despatch, also for any special observations or remarks, and it is advisable to show the sales book or day book folio against each entry. When an order has been fulfilled the transaction will automatically pass into the category of sales, and if the buyer is allowed a period of credit the full selling price will be posted from the book of original entry direct to the debit side of the particular personal account opened in the sales or customers' ledger.

Where no analysis of the sales is considered necessary or desirable, the monthly or other periodical totals of the sales book may be transferred to the credit side of a general sales account kept in the nominal or impersonal ledger; but if the manufacturer wishes to ascertain the margin of profit realised under two or more headings it is usually much more convenient to use a day book of the analytical type so that each transaction can be suitably classified at the time of making the original entry.

By using a book which has been provided by the printers with a sufficient number of cash columns, the trade purchases in the bought day book can be classified under specific headings and the monthly totals of each column debited to a separate goods or stock account. Various grades and concentrations usually appear under the general heading of "chemicals," and the "packages" column may include drums and kegs in addition to packages for pigments.

A separate "capital outlay" column is needed for the collection of all items representing the cost of acquiring new plant or renewing old equipment. Materials returned to the suppliers, including all allowances made in lieu of actual returns, may be entered in the end section of the purchases journal, where a few pages can usually be reserved for that purpose. The amount shown on each credit note is debited to the particular personal account, and the monthly totals either credited to the special stock accounts or deducted from the corresponding monthly totals of the purchases before the latter are debited in the ledger.

The introduction of an appropriate book-keeping and costing system designed to expose any bad organisation enables some chemical manufacturers to compile a monthly trading account for each department and to separate the profit or loss on the working of the departments without the necessity of drafting a balance sheet.

Controlling Stocks

To be of any real practical utility in this respect, all stocks—with the exception of the small working stock for each department—should be under the control of the stores section, where proper accounts can be kept to show all fluctuations in value. When only one product is manufactured there may be little difficulty in determining the actual cost, but if a department manufactures a number of different products the allocation of costs may depend on the knowledge and experience of the technical staff as much as on the ability of the works accountant.

Those in charge of stores should be provided with stock cards to be attached to

the different drawers, shelves and boxes, etc., thereby facilitating the recording of everything received and issued and a determination of the precise quantities on hand. Material required for the execution of an order is usually requisitioned on forms stating the product to be manufactured and the cost, and although the costing department is not concerned with materials until they have been issued, adequate supervision should be exercised over all acids, special fluids, metals and alloys, corrosive liquors and containers, etc., by keeping separate accounts showing the quantities, weights and numbers received and issued and the stock or balance remaining after the last issue to production.

Departmental profits or losses should be shown as separate items in the periodical trading or manufacturing account, the balance of which will be transferred to the profit and loss account, the main object of which is to arrive at the amount of net profit realised or the extent of the loss which has been sustained.

The figure of net profit shown in the final account will not, however, be accepted by the income tax authorities when computing the taxable profit under Schedule D, but will have to be subjected to very considerable adjustment for purposes of assessment. Certain items which have been charged to the account in the customary manner, while representing proper charges against revenue, will not be allowed to stand as deductions. Among these items may be the cost of structural alterations or repairs, additions, extensions or improvements to the business premises, and depreciation written off the book value of any asset or section of profit-earning equipment.

Wear and Tear

Although obsolescence and the decline of capital value constitute definite charges against profits, taxpayers are only granted wear and tear allowances which are considered by the Inland Revenue to be sufficient to cover those parts of the machinery and plant, etc., which have actually been worn out in the process of earning profits to be taxed. Such allowances must be claimed and not taken as granted.

Items representing ground rent, annual interest, annuities, or any payments of a similar nature from which income tax at the standard rate should have been deducted at the time of payment, are not allowed to stand as deductions, neither are expenses of a personal nature, of which are not directly connected with the ordinary business. Also in this category,

i.e., not being allowed to stand as deductions, are private drawings of the proprietor, or the salaries of the partners, including interest on capital and any payments made to inactive partners.

When book debts previously written off are recovered and added to a reserve or suspense account, the sum involved should be added back to the balance of profit for assessment purposes, or deducted from the loss, as the case may be. In cases where the proprietor resides on the business premises, only the statutory allowances for rent, rates and lighting will be granted. Consequently, if the full amounts have been debited under these headings, a proportion will be added back for income tax purposes.

Deductions from Profit

Items of the following nature, however, may be deducted from the figure of profit: all normal expenses and business charges; allowances made to employees (or their wives or children) called up for National Service; an amount equal to the annual value of the business premises, providing no charge for rent has already been made in the final account; items which have been debited to a reserve account or to a suspense account, but which could have been charged to profit and loss; rents received in respect of property owned, where such rents have been treated as income in the accounts, and this applies to items of cash received from sub-tenants providing no charge has been made against profits in connection with the premises sub-let.

Isolated gains of a private or non-recurring nature, such as from the sale of investments, etc., are not subject to assessment, and a financial loss sustained by one business can be set against the amount of profit realised by another business under the same ownership.

In order to determine the figure of taxable profit it is advisable to compile a special income tax profit and loss account, on the credit side of which should be entered the balance of net profit as shown in the ordinary profit and loss account, and to which should be added the various items which are not allowed to stand as deductions. Against this total should then be debited the various allowances to which the taxpayer is legally entitled, apart from those already charged in the ordinary way.

Manufacturers of chemical products who do not maintain a proper set of books on modern lines are usually over-assessed each year, as it is difficult to ascertain the precise results without undertaking a considerable amount of detailed analytical

work. In such cases, apart from the items allowed and not allowed by the income tax authorities in computing the balance of profit for assessment under Schedule D, a number of adjustments would have to be made, mainly in connection with debtors, creditors and stocks.

The following example will serve to indicate the method of ascertaining taxable profit from incomplete data. During the twelve months ended December 31 a chemical trader carrying on business on his own account and residing on the premises (which were rented at £210 per annum) was compelled to reduce his office expenses to such an extent that the keeping of a proper set of books was impossible. A complete record of the cash transactions had been made, however, and at the end of the year these items were dissected and grouped under appropriate headings to constitute a summary of receipts and payments. Stocktaking operations revealed an increase in the value of the stock as compared with the total at the termination of the previous year, and the book debts also showed an increase. The total sum owing to trade creditors was also higher, and the receipts and payments

account was accordingly drawn up from the particulars available.

The cash balance was taken as the basis for the computation, the difference between the opening and closing balances being treated as profit to which the deductions not allowed were added. The income tax account was made up as below.

Some of the smaller firms in the chemical industry cannot always apply satisfactory systems of book-keeping and consequently the bank transactions often have to be classified and the business assets revalued. Professional assistance is not always necessary, but it is impossible to compute the precise income tax liability unless all the original transactions have been recorded correctly.

The profits of partnerships are often assessed on the firms and not on the individual partners. The personal allowances to which each partner is legally entitled, however, are usually considered in relation to that partner's share of the assessment, and it is of the utmost importance that proper records should be made of all pecuniary and trading transactions. Only in this way can the maximum relief be obtained.

Debit

INCOME TAX ACCOUNT

Credit

	£	s.	d.		£	s.	d.
To Rents received ...				By Increase in cash balance ...			
„ Dividends received (tax deducted) ...				„ Payments not allowed:—			
„ Interest on loan (tax deducted) ...				Income tax ...			
„ Sale of tanks ...				Motor tax ...			
„ Increase in trade creditors ...				Mixing machines ...			
„ Balance, being taxable profit ...				Drawings (self) ...			
				Shop fittings ...			
				„ One-third of rent ...			
				„ Increase in stocks ...			
				„ Increase in debtors ...			
	£				£		

Scottish Magnetite and Diatomite

THE extent of magnetite deposits in Shetland is being investigated by a team of scientists from the Geophysical Prospecting Co., Ltd., London. The deposits were worked during the war but mining ceased when overseas sources were again developed.

Steady progress in the exploitation of diatomite in Skye is reported and considerably increased output is expected by mid-summer. One of the main problems has been the construction of roads to the deposits. Government aid has been received and the roads should be completed within three months. Good quantities of high grade diatomite should then be available to British industries.

Popularising Science

TO popularise scientific knowledge UNESCO is distributing gramophone records of talks on science for the layman, to be broadcast in Denmark, South Africa, India, Australia and the Philippines. "Atomic Energy as a Natural Resource," "Climatology," "New Eyes to the Sky" (telescopes), and "Solar Energy" are the subjects of some of these 15-minute informal discussions. A further example of the organisation's work to promote education is the publication and distribution to libraries, science museums, schools, etc., of booklets on popular science. One of these, recently published, is "The Popularisation of Science through Books for Children," by Amabel Williams-Ellis.



The Chemist's Bookshelf

SOLVENTS: sixth edition. T. H. Durrans, Editor, E. Howard Tripp. London, 1950: Chapman & Hall, Ltd. Pp. XXVII + 218. 21s.

Few books compiled for chemists and chemical industry are of ephemeral interest, yet there are great disparities in the life spans of sundry works, for which the changing and unpredictable course of chemical interests is responsible. "Solvents" is an outstanding example of the kind which is destined to endure because of the unwavering interest in the materials with which it is concerned. Since the appearance of the first edition—in 1930—there has been practically continual increase of the number of organic solvents and of the essential industrial uses found for them, in the lacquer and related industries, for which "Solvents" is primarily intended, and in many others. These circumstances and the continual widening of knowledge of the properties even of some common solvents seem to have justified the six editions of the monograph, of which the latest collates much of the important information which has become available since 1944. Among the most useful expansions are those concerned with plasticisers and plastics and the subject of toxicity, of which the last have an increasingly urgent importance in modern industries. The data on toxic possibilities, while highly condensed, leave no excuse for neglecting rigorous safeguards in the employment of such common solvents as trichlorethylene, carbon tetrachloride, methyl alcohol and carbon disulphide.

SYNTHETISCHE METHODEN DER ORGANISCHEN CHEMIE. W. Theilheimer. 1949. S. Karger A.G., Basle, Switzerland. Pp. VIII + 412; S.Fr. 40.

This is the third of the series dealing with new methods and principles of the synthesis of organic compounds and with improvements of older processes, of which the data have been collated from many international publications. The present edition is concerned with the 1946/7 period and part of 1948 and contains all titles of the two preceding parts. It is thus an important reference. An index key and

general register of starting and end products will be of help to English readers, for whom some English and American methods, omitted in the former volumes, are reviewed. It represents a very useful source of information, supplementing the Beilstein series. Set up in a semi-tabular fashion, the information can be very readily identified. A full index permits the rapid location of the references on any particular synthesis.

COLOURS AND HOW TO SEE THEM. H. Hartridge. London: G. Bell & Sons, Ltd. 1949. Pp. 158. 15s.

The book is based on the author's Royal Institution Christmas Lecture and discusses popular science of an interesting variety. In six chapters it describes what is not commonly understood about natural phenomena; how, for example, are produced the colours of sky and sea, of the aurora, plants, birds and butterflies. Here it may be recalled that the famous German painter Franz v. Lenbach always worked in front of a butterfly collection. The mysterious light of fluorescence and phosphorescence is described, and the means by which colours are recorded. The eye and the colour processes in photography, printing and television, and the illusions which these processes can give, are interesting reading. The author shows how and why colours are used in nature, art, science and industry, and details the strange properties of colours. His book, illustrated with colour, half-tone and line, is one of universal interest.

Science in Industry

CHEMICAL industry in Australia is the first of four reports included in Bulletin No. 4 of a new series 'Science in Industry' recently published by Murray, Bull & Co., Ltd., London, under the title "Technical Knowledge as an Exportable Quantity." Opportunities for chemicals in Australia are reviewed in the control of pests of livestock, as weed-killers, insecticides and fungicides, in mining, food preservation, for soap and other detergents, the treatment of textiles and in the rubber industry.

Technical Publications

SECONDARY recrystallisation of face-centred Ni-Fe alloys is discussed by G. W. Rathenau and J. F. H. Custers in "Philips Research Reports" (Vol. 4, No. 4; Philips Electrical, Ltd.). It is shown that the primary texture of severely rolled Ni-Fe alloys is the cubic orientation, but at high temperatures secondary recrystallisation (abnormal grain growth) may occur. Several new orientations were found. In the same volume, A. Guinier and J. Tenevin compare the perfection of the crystals of primary and secondary recrystallisation. It was found that if a broadening of the reflected image occurred the lattice planes of the crystal under consideration were bent.

* * *

PRESENTATION of industry's viewpoint, together with practical considerations necessary to give a balanced knowledge of chemical engineering, are set out in the fourth volume of the "Journal of the Imperial College Chemical Engineering Society" (Volume 4, 1948) now available. Papers and lectures include the presidential address on "The Use of Graphical Methods in Chemical Engineering Calculation"; "Valves for Process Plant", by C. R. Colley; "Technology and Chemical Engineering Design", by A. D. Edwards; and a description of the research in the department of Chemical Engineering and Applied Physical Chemistry given on the opening of the new temporary laboratories.

* * *

THE newly published 28-page booklet, "Lithium in Modern Industry," reviews significant developments in lithium chemistry since 1940 and makes some forecasts. Edited by the technical rules, research and development staffs of the (U.S.) Foote Mineral Company, this publication discusses the chemistry of lithium and lithium salts, the industrial applications of lithium compounds, and newer uses of these materials. There is a carefully edited bibliography of technical references.

* * *

ESTIMATION of ventilation air temperatures in deep mines based on the fundamental laws governing heat flow, is the subject of the main article by J. de V. Lambrechts in the February issue (Vol. 50, No. 8) of the *Journal of the Chemical Metallurgical and Mining Society of South Africa*, now available.



[Courtesy, The ACRU Electric Tool Mfg. Co., Ltd.]

Neon indicator lamp for scientific instruments and processes depending upon electrical operation. It can be used directly on mains voltage up to 440 volts, has an average life of 25,000 hours and current consumption is low

APPLICATION and development of alkalis as scientifically designed detergents to suit the manifold requirements of industry are described in a new illustrated booklet just issued by Joseph Crosfield & Sons, Ltd., entitled: "Crosfield Detergents in Modern Industry." A comprehensive review of the silicate detergents is given without going too deeply into technical problems.

* * *

DEVELOPMENT of scientific research was the subject of a supplement, "Review of the Progress of Science," published last week by the *Times*. Many eminent scientists were among the contributors, including: Prof. E. N. da C. Andrade on "The Fabric of Research"; Sir Ben Lockspeiser, "The Scope of Industrial Research"; Sir Ian Heilbron and Dr. A. H. Cook, "Organic Chemistry"; and Prof. R. E. Peierls, "Nuclear Physics Since the War."

* * *

"THE Manual of Open Die Forgings" (by the Open Die Forging Industry, 366 Madison Avenue, New York 17, N.Y.; \$3) represents several years' preparation by a number of American metallurgists. It covers the methods, practices, specifications and inspection technique used in the manufacture of open die ferrous forgings. The chapter on manufacturing process practices covers the various types of materials, ingot variations, the several steps of operations, control, irregularities and heat treatment finish.

HOME

Chlorine Chemicals Record

A record production of packed liquid chlorine, hydrochloric acid and sodium hypochlorite was attained last year by the BC section of I.C.I., Ltd.'s Cassel Works, states *The I.C.I. Magazine*.

Change of Address

Dexion, Ltd., specialists in constructional units and general industrial equipment, has acquired new premises at Triumph House, 189 Regent Street, London, W.1.

Tour of Oxford Colleges

A conducted tour of the Oxford Colleges has been arranged for members and friends by the British Association of Chemists on Sunday, May 14. Tea will be served in the Hall of Jesus College, by courtesy of Dr. G. T. Young, president of the Alembic Club which is co-operating in the arrangements.

Memorial to I.C.I. Workers

A plaque recording the names of 24 employees of the Marston Excelsior works of I.C.I. Metals Division, Wolverhampton, who lost their lives in the war, was unveiled last week at the Ford Houses (Staffs.) factory. The ceremony was performed by Mr. H. E. Jackson, chairman of I.C.I. Metals Division. Some 1200 workpeople were present.

Mather Lecture

Mr. F. Scholefield, head of the department of textile chemistry, College of Technology, Manchester, will give this year's Mather lecture on May 10, at the Grand Hotel, Leicester, following the 40th annual meeting of the Textile Institute. The address will deal with the contributions made to the textile industry by the late Sir William Mather, who was president of the institute from 1915-17 and initiator in 1919 of its Foundation Fund.

Ultrasonics for Killing Bacteria

Dr. A. T. Palin, of the Newcastle and Gateshead Water Company, told the National Association of Bath Superintendents conference at Southport last week: "We are at the beginning of something new in the use of ultrasonic vibrations in the killing of bacteria, and the Institute of Water Engineers has a research group studying the problem." Free chlorine was now being used in preference to chloramine in purifying water because of its superior disinfecting powers.

TIDU's New Quarters

The Technical Information and Documents Unit is removing to Lacon House, Theobald's Road, London, W.C.1 (telephone Chancery 4411) on May 1.

Paraffin Wax Prices

New prices for various grades of paraffin wax as from May 1 were announced by Shell Mex and B.P., Ltd., ranging from 110°-115° F., £58 10s., to 145°-150° F., £101 17s. 6d. a ton in lots of one ton and upwards. The price of scale is £51 17s. 6d.

Benn Book Agency

Ernest Benn, Ltd., has been appointed selling agent for the books hitherto published by Lindsay Drummond, Ltd. Ernest Benn, Ltd. is an associate company of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE.

Coal Production

Britain's output of deep-mined coal last week was lower than in the previous week. Comparative figures are: Last week, 4,116,900 tons; previous week, 4,175,100 tons; week ended April 30, 1949, 4,074,500 tons.

Tar Distillery Fire

A fire at the Camelon works of Scottish Tar Distillers, Ltd., last week, destroyed some 50 tons of naphthalene. Fire brigades prevented the blaze from spreading to the benzoline and other derivatives stored in the plant, and it is not expected that work will be interrupted greatly by the damage.

Organising the Instrument Sections

THE full text of the paper "Organising the Instruments Section" (THE CHEMICAL AGE 62, 615-618) delivered by Mr. V. H. Brown, instrument manager, Wilton Works, I.C.I., at a recent meeting in London of the Society of Instrument Technology, will appear in a future issue of the *Transactions* of the society.

Isotopes in Industry

A week-end course of lectures on "Isotopes in Industry" is to be held in the physics department of the University of Birmingham from Friday, May 19 to Sunday, May 21. The course, arranged by the Extra-Mural Department of the University, in co-operation with the Atomic Scientists' Association (Birmingham Branch), is intended for industrial engineers, metallurgists and chemists.

PERSONAL



Mr. E. Player, new president of the Aluminium Development Association

DR. A. G. QUARRELL, research manager to the British Non-Ferrous Metals Research Association, has been appointed to the new chair of post-graduate physical metallurgy in the University of Sheffield. The doctor, who is 39 years of age, has carried out laboratory investigation of the phosphorous reaction in the basic steel-making process. His research has also included work with hydrogen in iron and its influence on hair-line crack formation, and, with an electron diffraction camera, examinations of the transformations in iron oxide during cooling from high temperatures.

The following retiring directors were re-elected at the annual meeting of The International Nickel Company of Canada, Ltd., in Toronto, last week: Mr. JOHN P. BICKELL, Mr. JAMES S. DUNCAN, Sir WILLIAM T. GRIFFITHS, Mr. WILLIAM J. HUTCHINSON (treasurer), Lord McGOWAN, Dr. DONALD H. McLAUGHLIN, Dr. PAUL D. MERICA, Sir OTTO E. NIEMEYER, Mr. LAURANCE S. ROCKEFELLER, Mr. GRANT B. SHIPLEY, Mr. R. EWART STAVERT, Mr. J. C. TRAPHAGEN, and Mr. HENRY S. WINGATE (vice-president and secretary).

Mr. F. W. KENDRICK, recently Dunlop's acting sales manager for tyres in South Africa, has been appointed Dunlop tyre export manager in London. A Birmingham man, Mr. Kendrick was adviser to the Union of South Africa Rubber Controller during the war.

Dr. K. D. JACOB, chief of the U.S. Dept. of Agriculture Fertiliser and Agricultural Lime Division, Beltsville, Maryland, was made an honorary member of the Fertiliser Society last week during the all-day meeting at which his paper was read by the visiting research scientists of the U.S. Department of Agriculture, Mr. JOHN O. HARDESTY and Dr. KENNETH G. CLARK. Only one other foreign scientist has been made an honorary member of the society, Dr. SVEN NORDENGREN, of Sweden, who has also presented a paper to the society. Dr. Jacob's paper and the considerable discussion which it stimulated is referred to on page 667 of this issue.

Among those on whom honorary degrees were conferred at Oxford last week was Sir HAROLD HARTLEY, this year's president of the British Association. The Public Orator (Mr. T. F. Higham, Trinity) recalling the career of this former Fellow of Balliol, referred to his work as a leading physical chemist at Oxford and during the war as Controller of the Chemical Warfare Department, while later "railway and airway were alike entrusted to his capable and conscientious direction."

PROFESSOR JOHN READ, professor of chemistry in St. Andrews University, the winner of the 1949 Cortina-Ulisse European prize of 1 million lire for his book "A Direct Entry to Organic Chemistry," is using some of the prize-money to finance a lecture tour in Italy. The tour, which he is undertaking as a gesture of thanks to the Italians, was arranged by the British Council to take place between April 30 and May 23. He will lecture to scientists in 11 Italian cities, including Turin, Milan, Rome, Florence and Naples, on "Historical Science as an Instrument of Culture" and "Researches on the Chemistry of Australian Flora."

MR. HERBERT A. BATESON, of Bateson Bros., glass manufacturers, Liverpool, was elected president of the Society of Glass Technology at its annual meeting in Sheffield last week.

MR. B. G. CREWE, assistant controller of the Board of Trade Patent Office, retired at the end of April after nearly 50 years' continuous service. Mr. Crewe is an international authority on copyright and on industrial property.

OVERSEAS

U.S.A.'s Increased Iron Ore Imports

Imports by the U.S.A. of iron ore are reported to have been 8.3 million tons in 1949 (6.8 million tons in 1948). In 1947 they totalled 5,492,000, and in 1946, 3,085,000 tons.

U.S. Surplus Totals

The U.S. domestic sulphur industry produced 401,232 long tons of native sulphur during January, according to the officially collated reports of producers. Sulphur production in January 1949 totalled 416,678 long tons. Producers' stocks continued to decline.

Pierhead's Ocean Voyage

A 1000-ton pierhead, 200 ft. by 60 ft., now used as a floating oil dock in the Banka Strait, off the east coast of Sumatra has been towed by a Dutch tug from Southampton, via the Suez Canal—some 9000 miles in 67 days. The pierhead was once part of "Mulberry" the invasion harbour.

Swiss Exports in March

The value of Swiss exports of dyestuffs, etc., in March amounted to S.Fr. 18.1 million, compared with S.Fr. 17.1 million in February. Exports of pharmaceutical goods declined slightly from (S.Fr. million) 17.1 to 16.6. Shipments of industrial chemicals rose in value from 5.6 to 6.0 and those of cosmetics from 1.6 to 1.9. Total chemical exports realised S.Fr. 42.6 million.

More Tin from the Belgian Congo

The Compagnie Geologique et Minière, Brussels, intends to embark upon a large-scale tin mining programme in the Katanga area of the Belgian Congo, following the discovery of important ore reserves. It is planned to erect additional smelters and to double the capacity of the Manono smelters to raise the productive capacity of the Belgian Congo to 20,500 long tons p.a.

Canadian Mineral and Oil Survey

More than \$1.5 million has been provided in the estimates of the Canadian Department of Mines and Technical Surveys for the continuation of the systematic geological mapping of Canada, the study of potential sources of minerals, oil and natural gas, and for important ground water surveys. Particular attention will be given to those areas in the Prairie Provinces considered to contain oil, and a comprehensive investigation of the iron-ore region will be undertaken.

Scientific Council for S. Africa

It was officially announced from Cape Town last week that a conference will be held at South Africa House, London, from May 24 to 26 to discuss the establishment of a scientific council for Africa south of the Sahara, and to nominate scientists as members.

German Crude Oil

Crude oil output in the Federal German Republic in March amounted to 90,282 metric tons, an increase of nearly 10,000 metric tons over the February level. Output of the Quackenbrueck field, near Osnabrueck, which was opened up in February, registered a threefold increase.

Mercury Prices

The international mercury combine is stated to have been dissolved, although, in view of the hard currency earning power of this metal, Italian producers are understood to be in favour of a new agreement with the Spanish mines. The price of mercury has recently fallen considerably, and the present official export quotation ruling in Spain is now U.S. \$52.50 per flask, f.o.b. for quantities up to 100 flasks. Production costs in Spain are stated to be stable.

Indian Model Salt Works

A model salt works is being laid out at Suleimansha in Bombay with a research station and laboratory attached. At several other places salt works on model lines according to the plans approved by the Salt Department will be laid out by private licensees. The Government of West Bengal has decided to pay Rs.100,000 to technicians of a French salt manufacturing concern to survey the Contai sea board for the establishment of a large scale factory.

French Scientist Dismissed

The French cabinet decided last week that in view of the declaration made by M. Joliot-Curie, the noted physicist, at the Communist national congress at Gennevilliers early last month, it was no longer possible to maintain him at his post as High Commissioner for Atomic Energy. The post itself has been abolished, largely due to the fact that a statement has been issued by the team of scientists who worked under M. Joliot-Curie, which expressed the conviction that although they did not share his political views "the future of the commission cannot be dissociated from the person of its founder."

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HARD ALLOYS, LTD., High Wycombe, metal workers. (M., 6/5/50.) April 3, mortg., to Halifax Building Society, securing £7380 and further advances; charged on factory and premises at Beach Road, The Marsh, High Wycombe. *Nil. June 22, 1949.

JOHN HINCHCLIFF & SON, LTD., South Elmsall, tar macadam manufacturers, etc. (M., 6/5/50.) March 30, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Central Garage, Barnsley Road, South Elmsall. *Nil. June 3, 1948.

METAL & ELECTRO CHEMICALS, LTD., London, S.W. (M., 6/5/50.) March 28, charge, to Williams Deacon's Bank, Ltd. securing all moneys due or to become due to the Bank; charged on 96 Pollards Hill North, Norbury, S.W. *Nil. February 24, 1950.

WHITEHEAD CHEMICAL CO., LTD., Waterfoot. (M., 6/5/50.) April 4, charge, to Halifax Building Society, securing £2000 and further advances; charged on land at Warth, Waterfoot, and fixed plant and machinery. *— April 1, 1948.

XENIT PRODUCTS, LTD., Slough, dealers in chemicals and fabrics, etc. (M., 6/5/50.) April 3, £2400 deb., to Sciaky Electric Welding Machines, Ltd.; general charge. *£5868. June 3, 1949.

Satisfactions

PEST CONTROL, LTD., Bourn (Cambs.). (M.S., 6/5/50.) Satisfaction April 6, of debts. reg. Feb. 9 and April 23, 1949.

PEST CONTROL (UNITED KINGDOM), LTD., Bourn, (Cambs.). (M.S., 6/5/50.) Satisfaction April 6, of debts. reg. Feb. 9, and April 23, 1949.

SOLIGNUM, LTD., London, W.C., wood preservative manufacturers. (M.S.,

6/5/50.) Satisfaction April 6, of charge reg. Sept. 18, 1931.

ZAMA, LTD., Salford, textile water-proofers, etc. (M.S., 6/5/50.) Satisfaction April 11, of deb. and transfer respectively reg. June 11, 1930 and Feb. 9, 1940.

Company News

Albright & Wilson, Ltd.

The net profit of the Albright & Wilson group, attributable to shareholders for 1949, was £426,417. £66,000 was set aside for tax equalisation in respect of initial allowances, 1950-51, which arise from the parent company's capital expenditure in 1949. In addition, £62,000 was set aside from profits brought forward for initial allowances on capital expenditure in prior years. A final dividend of 15 per cent, less tax, on the ordinary stock was proposed.

Evans Medical Supplies, Ltd.

The directors declared a second interim dividend of 7 per cent, making a total distribution of 10 per cent for the year ended December 31, 1949.

I.C.I.'s Smaller Profits

The board of I.C.I., Ltd., in a preliminary statement announcing the forthcoming payment of a final ordinary dividend of 7 per cent to maintain the total year's dividend at 10 per cent, discloses that group profits in 1949, before taxation, declined to £17,323,509. The comparable figure in 1948 was £22,955,579, and both totals were reached after large provision had been made for obsolescence and depreciation (£4.5 million in 1949). Net income of the company, after deductions for subsidiaries and other charges was £9,791,503 (against £10,850,414).

Mullard Overseas, Ltd.

A new private company, Mullard Overseas, Ltd., has been incorporated, with a nominal capital of £250,000, to co-ordinate the export trade of the Mullard company from the United Kingdom.

Changes of Name

The following changes of name have been announced: Unifloc Reagent, Ltd., to Unifloc, Ltd.; Craghume, Ltd., to Severn Bridge Fertilizers, Ltd.; Ibeco, Ltd., to Ibeco Products, Ltd.; Portable Radiographs, Ltd., to Gamma & X-Rays, Ltd.; Air-Maze (Great Britain), Ltd., to Air-Maze, Ltd.

The Stock and Chemical Markets

MARKETS have taken their cue from British Funds, which remained uncertain, awaiting the result of the big British Electricity issue. Industrial shares moved narrowly and small declines seem to have predominated, opinion being influenced to some extent by the decreased profits reported by I.C.I., Ltd.

In common with a number of other large industrial concerns with world business, I.C.I. appears to have been affected last year by the effects of the minor and temporary slowing down of trade activity in the U.S.A. and by difficulties due to rising costs. Devaluation of sterling and other currencies on balance possibly had adverse effects on profits, it is thought in the City.

The full report and annual statement will be awaited with particular interest for an explanation of the change in the level of profits last year and for reference to prospects. The I.C.I. earnings have now come back roughly to the 1947 level, and profits continue to be dealt with conservatively. At 42s., the £1 ordinary units give a yield of nearly 4½ per cent on the basis of the unchanged 10 per cent dividend.

Monsanto have eased to 47s., at which there is a yield of rather less than 4½ per cent. Fisons were 22s. 6d. Albright & Wilson 5s. shares were steady at 28s. 9d. on the results and the unchanged 25 per cent dividend. In his annual statement the chairman refers to last year's decision to postpone the £1 million preference share issue because of general market conditions. Albright & Wilson will want more capital in due course.

Borax Consolidated have been steady at 51s. 6d., and Turner & Newall were good at 79s. 3d. on market talk of higher dividend prospects. United Molasses, at 41s. 9d., remained under the influence of the good impression created by the past year's results. The 4s. units of the Distillers Co. changed hands around 17s. 1½d. British Glues & Chemicals at 20s. 6d. were steady, but British Aluminium eased to 39s. 6d. British Oxygen eased to 91s. before the annual meeting, when reference is expected to be made to the company's new capital requirements and to whether an early issue is contemplated.

Iron and steels have been firm, helped by the good impression arising from results issued recently. Stewarts & Lloyds rose sharply to 53s. 9d. on the big increase in the past year's profits, which

reflect benefits from the large capital expenditure for development in recent years. Guest Keen, at 42s. 9d., were again favoured on expectations of good financial results. Elsewhere, Staveley eased to 78s. 9d., but Tube Investments, at £5½, were helped by the results of Stewarts & Lloyds, in which the company has a shareholding.

Triplex Glass at 19s. 3d. have held their recent improvement and United Glass Bottle rose further to 70s. Lever & Unilever were steadier at 40s. 9d. Boots Drug eased to 46s., Glaxo Laboratories were 46s. 10½d. and Associated Cement have been firm at 80s.

Shell were 61s. 10½d. and Anglo-Iranian £½.

Market Reports

TRADING in most sections of the industrial chemicals market is about normal for the time of year and delivery specifications under existing contracts are covering fairly good volumes. A steady flow of overseas inquiry is again reported with actual bookings well up to recent levels. The rise in non-ferrous metal prices has necessitated a number of price adjustments for chemical compounds but values otherwise are more or less unchanged. In the tar products market higher quotations are now ruling for benzols, toluols, xylois and naphthas as the result of the new tax on all indigenous light hydrocarbon oils.

MANCHESTER.—The generally firm undertone on the Manchester market for heavy chemical products has been further strengthened by the impending advance in railway freight rates and it is expected that this will be reflected within the coming weeks in higher prices in most sections. Meanwhile, a steady call for contract deliveries of the alkalis and other products has been reported this week, with a fair amount of new business on the home market as well as for export. The demand for most of the fertiliser materials remains at a seasonally high level. Taking the tar products market as a whole, there is a fair movement of supplies.

GLASGOW.—There has been considerable activity in the Scottish heavy chemical market, due to the fact that many are endeavouring to order ahead of the British Railways' proposed increase in rail rates, which, it is believed, will cause a very considerable increase in the cost of most goods. The Export Market is very inactive.

Next Week's Events

MONDAY, MAY 8

British Industries Fair

London: Olympia and Earls Court.
Birmingham: Castle Bromwich. (Until May 19.)

Royal Institute of Chemistry

Hull: Royal Station Hotel, 7.0 p.m.
Annual general meeting. Dr. H. Baines:
"The Photographic Latent Image".

Porton: Chemical Defence Experimental
Establishment, 3.30 p.m. (Mid-Southern
Counties Section.) Dr. R. W. Pitman:
"Some Aspects of the Chemistry of the
Group VI Elements". (To be repeated at
the Municipal Technical College, Bourne-
mouth, Tuesday, May 9, at 7.30 p.m.)

TUESDAY, MAY 9

The Chemical Engineering Group (SCI)

London: Burlington House, Piccadilly,
W.1, 5.30 p.m. Dr. J. W. Barrett: "Sili-
cones—Their Production and Uses".

Society of Instrument Technology

Manchester: Reynolds Hall, College of
Technology, 7.30 p.m. Annual general
meeting. Dr. N. S. Gregory: "Some
Modern Aspects of Hygrometry".

THURSDAY, MAY 11

The Royal Society

London: Burlington House, Piccadilly,
W.1, 8.30 p.m. Conversazione and exhibi-
tion.

Incorporated Plant Engineers

Newcastle-on-Tyne: Turk's Head Hotel,
7.15 p.m. "Pumping Equipment" (Sig-
mund Pumps, Ltd.).

FRIDAY, MAY 12

The Chemical Society

Birmingham: The University, Edgbas-
ton, 4.30 p.m. (with Birmingham Univer-
sity Chemical Society). Prof. C. A.
Coulson: "The Shape of a Chemical
Bond".

The Royal Institution

London: 21 Albemarle Street, W.1,
9.0 p.m. Sir Lawrence Bragg: "Famous
Experiments in the Cavendish Labora-
tory".

Society of Glass Technology

St. Helens: Gas Showrooms, 6.0 p.m.
Annual general meeting and "Question
Box".

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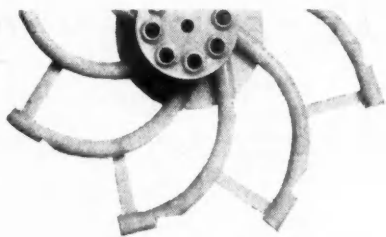
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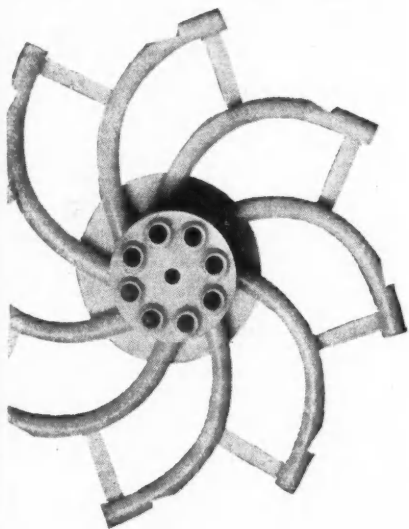
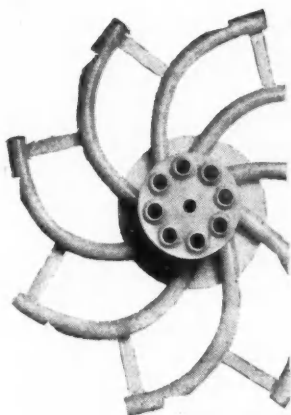
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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

ASSISTANT Works Chemist required by well-established London manufacturing chemists to under-stand chief chemist, test raw materials, etc. Position offers wide scope and excellent prospects in rapidly expanding sections of the business. Previous disinfectant and soap experience an advantage and training up to intermediate or final degree standard desirable. Salary according to experience, but applicants should state amount expected. Applications in writing, giving complete details of age, qualifications, experience and present and former employers (which will be treated in the strictest confidence), should be sent to **MANAGING DIRECTOR**, Box CA 2914, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

APPLICATIONS are invited by the Division of Atomic Energy (Production) for the following appointments at the Division's Factory, Capenhurst, Chester.

POST 1—DEVELOPMENT GROUP MANAGER. To take charge of a Physics Research and Development Group, involving metrology, kinetic theory, properties of matter, fluid dynamics, heat, mass spectrometry and high vacuum technique. Candidates must have a good knowledge of classical physics with a practical bias and have had at least five years research experience in physics or related subjects.

POST 2—ASSISTANT GROUP MANAGER. To undertake mathematical research into atomic energy problems. Candidates must have had at least three years research experience in mathematics, physics or engineering.

POST 3—WORKS PHYSICIST. To undertake the duties outlined in Post 1. Experience in physics research would be an advantage.

Candidates for Posts 1 and 2 must have an honours degree in physics or an Associate-ship of the Institute of Physics. A doctorate would be an advantage for Post 1. Candidates for Post 2 must have an Honours Degree in Mathematical Physics or Mathematics. Appointments will involve 18 months initial service at the Division's Springfields Factory, Nr. Preston.

Salary will be assessed according to qualifications and experience within the range: **Post 1**, £997 to £1,192; **Post 2**, £720 to £960; and **Post 3** (if over 30), £570 to £720 or (if under 30) £330 to £570 according to age.

Applications to **Ministry of Supply D. At. En. (P) Risley, Nr. Warrington, Lancs.** Ri. 9772-MES (18.4.50).

CIVIL ENGINEERS. Excellent prospects and permanency with Bahrain Petroleum Company Limited, for Civil Engineers not over 40 years of age, with Degree and experience of design and erection of steel and reinforced concrete supporting structures as encountered in oil refinery or similar heavy chemical process plants. Twenty-four to thirty months agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs, but no married accommodation available for two years. Write, with full particulars of age, experience, education and salary required, to **Box 3428, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

SCIENTIFIC GLASS MANUFACTURERS with London factory and rapidly expanding business in interchangeable industrial and laboratory glass-ware, require **SALES REPRESENTATIVE** in the Manchester-Liverpool area. Might consider a part time man on commission basis. Write giving full details of experience. **Box No. C.A. 2915 THE CHEMICAL AGE, 154 Fleet Street, London. E.C.4.**

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DESIGNS ENGINEERS. Excellent prospects and permanency with Bahrain Petroleum Company Limited, for Mechanical Engineers, not over 40 years of age, with B.Sc. Degree or equivalent qualifications. Experience required in design and/or construction of oil refineries, coal-tar, chemical distillation plants, or similar involving electrical and steam systems, pressure vessels, fractionating columns, heat exchangers and pumping equipment. Twenty-four to thirty month agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs, but no married accommodation available for two years. Write, with full particulars of age, experience, education and salary required, to **Box 3429, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

RESEARCH MANAGER Scottish Agricultural Industries, Ltd., Edinburgh, invite applications for a Research Manager, to organise and lead a research unit about to be set up (probably in the Edinburgh district), to investigate scientific and technical problems of chemical fertiliser manufacture. Applicants should have Honours Degree in Chemistry (preferably Inorganic and Physical), good research experience, including knowledge of modern physico-chemical techniques, and the ability to initiate, supervise and carry out experimental work. The position is permanent and pensionable and will command a high salary; the initial salary will be determined by the age, qualifications and experience of the successful applicant. Apply **Secretary, S.A.I., Ltd., 39, Palmerston Place, Edinburgh, 12.**

WORKS CHEMISTS required by the Division of Atomic Energy (Production) at Springfields Factory, Salwick, Nr. Preston and Windscale Works, Sellafield, Cumberland. **POST 1** to undertake supervisory duties in connection with the operation of large chemical plants. At least three years' industrial experience is necessary. **POST 2** to undertake chemical research and development work involving fluorine chemistry, corrosion problems, material testing and the use of elastomers and high polymers initially at Springfields Factory for 18 months, and later at the Division's factory, Capenhurst, Chester. Some experience of this nature, with a bias towards inorganic chemistry would be an advantage. Candidates must have an honours degree in chemistry or associateship of the Royal Institute of Chemistry or the Institute of Chemical Engineers.

Salary will be assessed (if under 30) according to age and qualifications within the range £330-£570 p.a. and (if over 30) according to experience and qualifications within the range £570-£720 p.a. Applications to, **Ministry of Supply, D.At.En. (P) Risley, Nr. Warrington, Lancs.** Ri. 9800-20.4.50-LSH.

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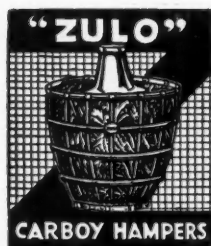
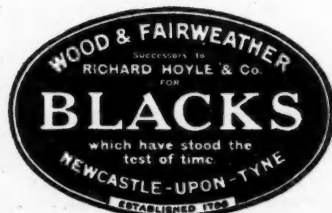
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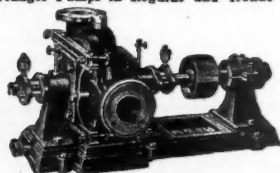
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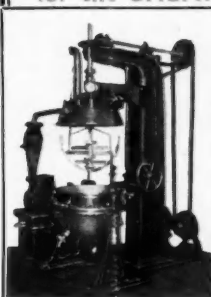
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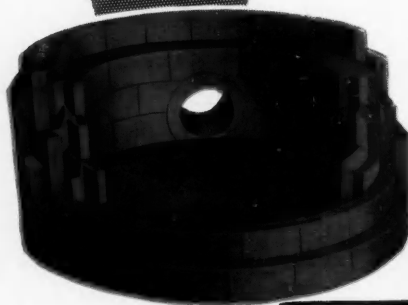
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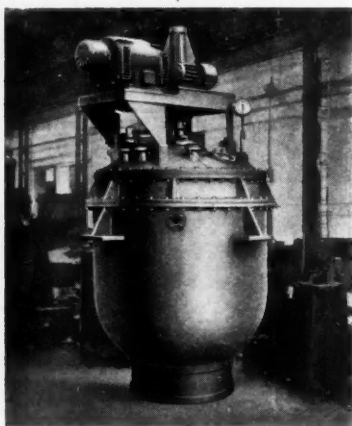
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